SCIENCE

FRIDAY, MARCH 5, 1915

CONTENTS

The Value of Zoology to Humanity:—
The Cultural Value of Zoology: PROFESSOR EDWIN GRANT CONKLIN 333

The Value of Scientific Genealogy: DR. CHAS. B. DAVENPORT 337

The Eugenics Movement as a Public Service: PROFESSOR G. H. PARKER 342

Preparedness for Peace: DR. STEWART PATON 348

John Muir: WILLIAM FREDERIC BADÈ 353

Scientific Notes and News 355

University and Educational News 358

Discussion and Correspondence:—
The History of Science: DR. FREDERICK E. BRASCH 358

Scientific Books:—
Mawson's The Home of the Blizzard: GENERAL A. W. GREELY. *Lange's The Lower Amazon:* PRESIDENT JOHN C. BRANNER..... 360

Botanical Notes:—
Another Applied Botany Book; Cybele Columbiana; Short Notes: THE LATE PROFESSOR CHARLES E. BESSEY 364

Special Articles:—
A Fourth Mallophagan Species from the Hoatzin: PROFESSOR VERNON L. KELLOGG. *The Toxicity of Insecticides:* PROFESSOR C. W. WOODWORTH 365

The American Society of Naturalists: DR. BRADLEY M. DAVIS 369

The American Society for Experimental Pathology: DR. GEORGE H. WHIPPLE 370

MSS. intended for publication and books, etc., intended for review should be sent to Professor J. McKeen Cattell, Garrison-on-Hudson, N. Y.

THE VALUE OF ZOOLOGY TO HUMANITY[1]

THE CULTURAL VALUE OF ZOOLOGY

ALL sciences are so interrelated that it is not easy to point out the distinctive contributions of any one science to human welfare, and in particular I have found it impossible to separate zoology from other biological sciences in this regard. Accordingly, in what I shall say it will be understood that I am speaking for all the biological sciences and not for zoology alone.

Again culture is no single definite object, but a general and rather indefinite ideal. There are many kinds of culture—physical, intellectual, moral, esthetic, religious, governmental, etc.—but each and all forms of culture may be regarded from the standpoint of the individual or from that of society; the former we call education, the latter civilization.

I. CONTRIBUTIONS OF BIOLOGY TO EDUCATION

The method of the scientist is to generalize only from particular objects or phenomena, and a naturalist, if asked what the cultural value of biology is, would ask to see some of the specimens. The members of this society are my specimens, my living exhibits of the cultural value of biology. What are your distinctive cultural characteristics? To avoid the personal error it would have been well to have asked each one of you to describe the characteristics of some other member of the society, but making allowance for the personal error, I believe that the biologist shows the following qualities:

1. Immense enthusiasm and intense con-

[1] Four papers in a symposium before the American Society of Naturalists, Philadelphia, December 31, 1914.

centration in his work. He desires no vacations except for bug-hunting and collecting. His idea of a good time is to have a day off for work with his microscope. He is a biologist because the tendency within him is too strong to be resisted. He feels that he was born for one work only. In a peculiar sense he has had the baptism of science—he has "renounced the Devil and all his works, the vain pomp and glory of the world," and has devoted himself with singleness of purpose to one particular subject which seems to him the central theme from which all others radiate.

But this very enthusiasm and concentration has its dangers for it is liable to destroy the sense of perspective and proportion. President Lowell has several times referred to a university course, whether real or mythological he does not say, on the "Antennæ of the Paleozoic Cockroach"—a highly specialized course, it must be admitted, and yet probably no more so than many others to be found in our universities. Our opinions regarding the value of any subject are greatly influenced by our knowledge or ignorance of that subject. There are persons who laugh at all foreigners; they think "they are so funny." There can be no doubt that specialization on any subject which is out of the ordinary seems funny to those who think only conventional thoughts. A great biologist was once at a public reception where he looked and doubtless felt much out of place. A society woman tried to engage him in small talk, but he replied, "Madam, the Maryland oyster is being exterminated." The original "Professor Mooner" of the comic papers was probably an old-fashioned naturalist. Intense devotion to work is a fine thing and has cultural value if properly balanced by a true sense of proportion, but the effect is otherwise if this concentration blots out for one the rest of the universe.

The evil effects of over-specialization are shown in many ways among biologists—not only in the lack of ability to understand or appreciate many other lines of work, but also by the very prevalent notion that the biologist who engages in economic work or who devotes himself to public service has somehow lost caste, and also by the contrasting opinion held by some "practical" biologists that "academic biology should be classed with embroidery." There are many good biologists in economic work, but there are relatively few in public life, and it is a pity that it is so, for on many biological problems of the highest interest to society the biologist could speak with an authority at least as great as that of the sociologists, who are frequently more sure of our results than we are ourselves, an authority greater than that of the propagandists who invent their own biology. On the other hand, there are a few great leaders in biology who have become teachers and interpreters to the plain people, men who like Huxley, Galton, Metchnikoff and Forel have dared to apply the teachings of biology to social problems, and there are more biologists who would do this if they were not restrained by the fear of losing caste among extreme specialists.

But, after all, concentration and narrowness are by no means characteristic of biologists and are probably to be ascribed to the weakness of human nature rather than to the influences of biology.

2. A second quality which is more truly distinctive of the biologist is to be found in his powers of observation and imagination. Other sciences also train both of these faculties, but in a peculiar sense the living world is an eternal challenge and stimulus to the powers of observation and constructive imagination.

No one can have failed to notice the great interest which all persons show in living objects. Men, women and children will

watch without weariness the movements of living things when they could not be induced to study the pictures of them in a book. Even many of the higher animals show great interest in and curiosity about moving objects which would remain unnoticed if perfectly still. Is not the source of this universal interest in living things to be found in the fact that we recognize in them fellow creatures with feelings akin to our own? Is not the great craze for moving pictures due to the fact that the movements make the pictures live?

Instinctively we recognize the kinship of all living things; instinctively we attribute to them the joy and sorrow, the fear and courage, the love and hate which we also experience; instinctively our curiosity is aroused and our observation and imagination are stimulated. And when we are older grown and have learned more about the "mechanism of life" do we not find that our curiosity, admiration and wonder are increased rather than diminished? Does not the great mystery of life appeal to the biologist even more than to others? I am sure that I represent the experience of every biologist when I say that the living world is a powerful and unfailing stimulus to the faculties of observation and imagination.

3. Biology occupies a unique place among all the sciences in its cultivation of esthetic appreciation and broad sympathies. It was for this reason that the late Professor Blackie said that he would have all young persons taught music and natural history. The naturalist is an artist in spirit if not in technique. It is sometimes a question how to classify the great artist-naturalists of the past such as Leonardo, Chamisso, Goethe and Audubon, and even if in these days of greater specialization the technique of art and of science are rarely combined in the same person the spirit of the two is combined in every naturalist worthy of the name and not infrequently strives to express itself in the figures and plates with which he adorns his scientific papers.

The biologist is thrilled by the beauty, the fitness, the mystery of organisms, and no scientific explanations of this beauty, fitness and mystery can destroy the esthetic appreciation which they cultivate. In the anatomical study of dead bodies there is less of this esthetic sense than in the study of living, moving, sentient beings, and yet was it not Johannes Müller who said "The anatomist should have the eye of an angel, the hand of an artist and the stomach of a pig"?

With this esthetic appreciation of nature there is mixed a broad sympathy with all living things. We can appreciate the feelings of that student who said that before he studied biology he used to try to crush the earthworms on the walks, but now that he had learned something about their marvellous structures and habits he carefully avoided stepping on them. Every ornithologist can appreciate the feeling of St. Francis of Assisi who called the birds his brothers. In this building which is a monument to his ability and energy I can not forget the naturalist Montgomery, who remembered to his dying day "the thrill with which he first heard the song of the blue bird" and who rejoiced that he was a part of immortal nature.

The biologist has his eyes open to the beauties, the joys, the sufferings of living things. What an outrage it is that he is so often pictured as a cruel and bloody monster! His sympathies extend not merely to his humbler brothers, but his human sympathies are broadened and deepened. The real naturalist can not look upon the Germans or Russians or French or English as monsters. He recognizes his kinship not

merely in body, but also in spirit to all of them, and he is able to understand and appreciate and in a measure to sympathize with all men. Hate and distrust are born of ignorance; knowledge brings sympathy. "To know all is to pardon all." Only a broader knowledge of and sympathy with our fellow men can end class and race antagonisms and guarantee a lasting peace. The study of biology, in broadening the sympathies of men and in cultivating esthetic appreciation, occupies a unique place among all the sciences.

These elements of personal culture are not absolutely distinctive of the biologist. Some persons wander into biology whose inherited tendencies are too strong to be overcome by its discipline; some good men in other fields are biologists gone astray; but in general these qualities are characteristic of the biologist.

II. CONTRIBUTIONS OF BIOLOGY TO CIVILIZATION

1. First among all the contributions of science to civilization stands the emancipation of man from various forms of bondage. Science has to a large extent freed civilized man from slavery to environment; it has well-nigh annihilated time and space, it has levied tribute upon practically the whole earth to supply his wants, it has taught him how to utilize the great resources of nature and to a large extent it has given into his hands the control of his destiny on this planet.

In this conquest of nature all sciences have been represented and it is difficult to apportion exactly the credit due to each. This is well illustrated by the various claims which are being made at present as to who built the Panama Canal. It is claimed by Colonel Roosevelt, by the army and navy, by the engineers, by the doctors and sanitarians, and one ought not to forget the workmen from the United States and the Jamaica negroes, though they are saying little about it. That biologists can put in a strong claim can not be doubted when we reflect upon the former French attempt to build the canal and the ravages of malaria and yellow fever which helped to defeat that enterprise. I suggest as a topic for a general debate at the meetings of the American Association for the Advancement of Science at the Panama-Pacific Exposition next summer this question, "Who built the Panama Canal?" I am sure that biology will be able to show that it is entitled to a large share of the credit.

The contributions of biology to civilization are not generally regarded as equal to those of physics, chemistry or engineering, and yet they are many and great and are constantly increasing in importance. Indeed, the debt of civilization to biology is absolutely incalculable, as may be appreciated when one mentions merely the names of some of the biological sciences, as for example, agriculture, animal breeding, bacteriology, experimental medicine, pathology, parasitology, physiology, sanitation. All of the great advances in these fields in recent years are the results of the study of living things, whether that study was done in a biological laboratory or not, and they are therefore the contributions of biology to culture. Indeed, the very continuance of civilization depends upon biology; there were civilizations of the past which went down under the onslaughts of pestilence and famine, as well as of war, and if our civilization is to advance it must rely upon biology to teach improved methods of warding off disease, of increasing and conserving the food supply and of improving the human breed.

2. But the highest service of science to culture has been in the emancipation of the mind, in freeing men from the bondage of superstition and ignorance, in helping man

to know himself. The message of science to mankind has ever been the message of intellectual enlightenment and liberty, "Ye shall know the truth and the truth shall make you free."

The greatest contribution of biology to intellectual emancipation has been the doctrine of evolution, that great theory which has revolutionized all our thinking regarding man and nature. And evolution is the distinctive contribution of biology to civilization, for it was in the living world and especially in the human realm that the doctrine of evolution came as the great emancipator from superstition and ignorance. The greatest theme of evolution is not the origin of species, nor even the origin of living things, but rather the oneness of all life. This is indeed the greatest principle of biology, namely, that through all the endless diversity of the living world there runs this fundamental similarity and unity. We also are living things and all that concerns other forms of life is of direct interest to us. In the lower organisms we see ourselves in simpler and more primitive form; we see man from the standpoint of the whole living world, as superior beings in another planet might look upon us, and as a result we have ceased to a large extent to regard the universe as existing merely for us. In this intellectual revolution we have ceased to occupy a position of solitary grandeur in a little human universe; we have not grown less, but nature has become so much greater that man's relative position in nature has changed.

Contrast the old view of creation, that the universe was made in six literal days, with the revelations of science as to the immensity and eternity of natural processes. Contrast the old view that all organisms arose suddenly by divine fiat with the view that animals and plants and the world itself are the result of an immensely long process of evolution. Contrast the old anthropocentric view of nature and of man with the new biocentric view which evolution has revealed; the old notion that man was absolutely distinct from all other creatures with the new conception of the oneness of life. As Darwin so beautifully says,

> There is grandeur in this view of life with its several powers having been breathed by the Creator into a few forms or into one, and that whilst this planet has gone cycling on according to the first law of gravity from so simple a beginning endless forms most beautiful and most wonderful have been and are being evolved.

Biology has changed our whole point of view as to nature and man and has thus contributed more than any other science to the intellectual emancipation of mankind.

EDWIN G. CONKLIN
PRINCETON UNIVERSITY

THE VALUE OF SCIENTIFIC GENEALOGY

FROM out of the middle ages when learning was treasured by encloistered scholastics has come the tradition that science is necessarily esoteric; and that pure science has little or nothing to do with human affairs; and thus is to be contrasted sharply with the humanities. During the past half century anthropology, social as well as physical psychology and psychiatry, and medicine have developed into well-recognized sciences proceeding by methods as objective and experimental as physics or chemistry and contributing to our knowledge of the field lying between the sciences of biology and chemistry; and of behavior and morphology. To-day the man of science is quite willing not only to apply to the human species the laws that have been determined by the study of other organisms, but he is recognizing that man himself is as good material to use in getting at scientific principles as any other species; and that in certain subjects man affords the *best* mate-

rial for scientific investigation, and that the investigation of man gives a peculiar zest to research because the results are so obviously applicable to our human life. No doubt these considerations are responsible for the fact that to-day we are enquiring into the value of scientific genealogy.

Although the copy-book states that man is an animal, it appears that, until recently, zoologists considered that man is an anthropos and they had nothing to do with him. And so long as the work of the biologist was the description of species, or the study of structure this attitude had a certain justification. But a new era has arisen; an era in which for certain studies the old classifications of botany, zoology and anthropology are being disregarded. These studies may be grouped under the head of general biology. This field includes such matters as general cytology (embracing maturation and fertilization), general embryology (including physiology and chemistry of development), genetics, and general physiology (including irritability). And we find that the phenomena of these sciences are the same for *all organisms* and that all may be used to contribute data to these sciences. And now any biologist feels at liberty to use any material, from any "kingdom," for his studies.

Not only in this matter, but in another, a great change has entered the spirit of our dreams. Formerly the zoologist, still cherishing in manhood the childish delight of collecting animals and studying with uninhibited enthusiasm the details of their structure, found it difficult to answer the question that his fellow human beings put to him, "What are your studies good for?" was able to show few points of contact between zoology and human affairs (except the fisheries and some parasites) and so assumed the lofty attitude of esotericism. But now the biologist is dealing with facts whose bearings are appreciated by any fairly well educated layman. Workers in any one of the fields of general biology are apt to be *importuned* by publishers; and there are men, though few in number, who live in luxury by writing books and giving popular lectures on biological topics! We have hardly to urge the importance of biology to humanity.

In no field of biology is there a greater popular recognition of the importance of biological research than in that of genetics. The reality and the bearing of the new science have gained a general recognition; the realization of the limitations of the methods of amelioration and of training and of hygiene have paved the way for such recognition; and to-day people are coming to look at man as the biologist does, namely, as an animal, comprising hundreds of elementary species, whose potentialities for physical, intellectual and moral development differ tremendously.

If there were anywhere a community that was wholly isolated, whose progenitors were exactly or very closely alike and which was highly inbred, then all the members of that hypothetical community would belong to the same species and it would follow that the facts of genetics would have little importance for such a community, and there would be little need in such a community for a scientific genealogy. But, as a matter of fact, the human race is practising what is, perhaps, the biggest experiment in hybridization that the world has ever seen. And this vast experiment is pregnant with possibilities for good or evil so great that they can not be calculated. Any practical breeder who was carrying on such an enormous system of cross breeding and attempted to keep the details in his head would be recognized as guilty of a colossal folly; and no scientific breeder would, of course, be capable of such

a thing. And yet this precious human kind of ours, whose progress is so fateful to the world, goes its blind way, like any jelly-fish, mates almost at random and then, after two or three generations, has lost all knowledge of the matings that have gone before. Of course, the race has got along, somehow, just as the lower animals get along; although we have been burdened with an intelligence sufficient to lead us to interfere with the operation of pure instinct but not sufficient always to interfere wisely. There are those who urge that the matter of marriage selection should be left to instinct; forgetting that in adult man (with his enormous development of the inhibitions) instinct has been so repressed as to have become a very unsafe guide. There are those who adhere to the obviously false doctrine that men are born equal and therefore it really doesn't matter who marries whom. It is, however, easy to show that it does matter tremendously. Also I think it quite within the range of possibilities that it will become incorporated into the mores that persons who are thinking of marrying should learn something about the genealogical history of the proposed parents of their children. And, again, it is highly probable that, after we have learned the method of inheritance of racial traits and can state the consequences (certain or probable) of particular matings, that such precise knowledge will influence human conduct even as a knowledge of the causes of yellow fever has influenced human conduct and has led to a vast reduction in the morbidity from that disease. When our knowledge of the inheritance of racial characteristics becomes fairly complete and widely diffused it can not be doubted that such knowledge will influence many selections of mates.

The fact that the nature of the mating does influence the progeny is well brought out by the study of half fraternities, both those in which the father and those in which the mother is the common parent. The economic and other environmental conditions are as similar as possible; the difference in the progeny is therefore the more readily ascribed to the difference in blood. I have collected many of these cases of double matings; and one of them may serve us now as an illustration.

A man whom we may call John Wolley, born 1668, son of a merchant and his wife (sister of the first rector of Yale College), graduated from Harvard College, entered the ministry and finally settled in a church in southeastern Connecticut. He had no brother who survived infancy, but three sisters who married well. This John married twice. His first marriage was to a widow, Martha *née* Silver. About the Silvers of that day I can learn little; they were apparently quiet, steady folk who took no very active part in the affairs of the community. Martha is described in the town minutes as "that eminently pious and very virtuous matron." This couple had 7 children of whom one died at 9 years, leaving 6—4 girls and 2 boys—to grow up. Of the younger son we know only that he was born, married and died, having held the office of deacon. The other brother, at his father's death, removed to a farm five miles back from the village which his father had received as a testimony of regard from the town. In his will the father asked the son to improve the farm (about 500 acres) thus left him. The son lived on the farm, married a woman of no outstanding name, with 23 others founded a church near by, and died at the age of 44 years, leaving 14 children, of whom the eldest was not yet 19. Of these 14 children, 9 were sons and apparently none died in infancy but of all the nine sons there is nothing of importance to note of any except birth, marriage and

death, and except that one son was a lieutenant in the Revolutionary war and died in battle. The eldest of these 9 sons had 2 daughters and 2 sons. All died in early life, except one son who cultivated the farm, built houses with his own hand, married into a good family and had two sons, born 1789 and 1787, who survived early youth and both of whom became quiet, steady farmers, noted for their common sense and contentment.

The Rev. Wolley, born 1668, of Connecticut, married a second time; this time to a daughter of John Morris, of one of the leading families of New York and New Jersey of colonial times—great landholders from which Morrisania, now in the Bronx Borough, New York City, and Morris County, New Jersey, are named, and from this union there were two sons. The elder of them was Benjamin Wolley, graduated Yale College, 1732, and married a daughter of Jonathan Edwards's sister. He held the highest position the town had to offer, represented the town in the state legislature through 25 sessions and was for a time clerk of the house; was state senator for 8 years, and was judge of probate and county judge to his death. During the Revolution he helped organize the army; was one of the committee of safety for the state and was always consulted by Governor Trumbull and General Washington as one of the wisest counselors in one of our most trying days. During a session of the legislature occurred the "Dark Day" of 1780; when it was proposed to adjourn the legislature on account of the impending judgment day, he opposed the motion on the ground that its duty lay in proceeding and asked to have candles brought in. This Benjamin had a brother Thomas who graduated from Yale College, entered the ministry, took part in the "Great Awakening" of Whitfield, showed signs of extraordinary elation, set out on a tour of evangelization, once addressed an audience for 24 hours and then fell into a depressed state. Again elated, he ran into great extravagances, threw suspicion on ministers who did not sympathize with his work, called on the people to commit to the flames jewelry, rings, their best clothing and various books which were listed on his index expurgatorious. He then returned to a more normal state again, renounced his former methods, and lived a quiet life during the 12 years that he survived.

Benjamin Wolley and the niece of Jonathan Edwards had a son, John, graduated from Yale College, 1770, took an influential position in the Revolution; was in congress for 18 years, and held positions on the most important committees. His only brother (Henry), graduated from Yale, 1779, was in the commissary department of the Revolution; was in legislature, court of common pleas, representative in congress, was on the corporation of Yale College and died in his 39th year. Later descendants include leading merchants, manufacturers and inventors.

Note the tremendous contrast between these two sets of half brothers—the quiet farmer and the unknown brother of the first mating; the statesman and unstable but magnetic revivalist of the second. The contrast of the product of these two half fraternities is also striking and serves to show the far-reaching consequences of marriage selection.

Since the nature of the mating is of such profound importance for progeny, a knowledge of genealogical history is of the greatest moment in connection with marriage selection. The presence of highly undesirable positive (dominant) racial traits in the family of either one of a pair of young people who are becoming interested in one another should be known to both.

If they marry and have children in the face of the knowledge that at least half of their children will have the same undesirable trait, perhaps their poignant regrets or the sad example will make it easier for some couples in the next generation to mingle some intelligence with their wooing.

In still another respect a knowledge of racial traits may well be of advantage, and that is in the training of a child. Vegetable seedsmen usually send with their seeds directions as to the specific culture of the particular variety. Now, different children have all the racial distinctness of different kinds of cabbages or melons, and it is unwarranted assumption that they all have the same capacities to be educated and that there is a single course of education that is best for them all. The time is coming, we may trust, when a teacher shall begin a class with something more from the registrar's office than the names of his pupils, when it will be recognized that the teacher can train his pupils the more intelligently and effectively the more he knows about the racial qualities as depicted in the family histories of the individuals he is to train.

So, too, in assisting a young person to decide on a vocation it is now recognized as useful to have an analysis of the traits of the person, as far as they have been developed. But the wise adviser will want to go farther and to study the family history of the young man to see if it may not suggest undeveloped potentialities and thus help in a decision as to the kind of life work he should undertake.

Admitting the value of a knowledge of the presence and distribution of racial traits in a family the question remains: What form should genealogy take in the future to furnish the desired information? Since families are merely collections of related individuals, what is needed is, for as many members of the family as possible, a record which should comprise not only the usual statements about birth and marriage and also the biographical and social data so commonly found, but, in addition, and above all, physical and mental data including build, proportions, pigmentation, quality of sense organs and other important physical traits, also the mental equipment, tastes for particular occupations, temperament and social reactions. Because of their importance for advice as to the care of the health, the facts of liability to disease, of grave illnesses and of surgical operations should be given and precise cause or causes of death of those who have died. Those individuals who are willing to give more time to their record will find a detailed *analysis of the personality* an absorbing occupation. Guidance in such an analysis may be obtained from the "Outline of a Study of the Self" by Yerkes and LaRue, also from a "Guide to the Analysis of the Personality," by Drs. August Hoch and George S. Amsden, printed in Bulletin No. 7 of the Eugenics Record Office. It takes several hours to make such an analysis and record; but it has to be done only once in a lifetime and perhaps we owe it to posterity to leave behind us such a record. To encourage the making of such records the Eugenics Record Office, at Cold Spring Harbor, distributes free to applicants a schedule which was based in the first instance on Galton's "Record of Family Faculties" and has undergone three revisions. About 20,000 of these schedules have been distributed to individuals, on request. This fact indicates that there is a widespread interest in this country in making a record of family traits.

It is not sufficient, however, that records be made. In order that such records should be of the greatest service to humanity they should be deposited in a central bureau where they are to be kept as confidential

records, but where they will be available in the biological interests of the human race, for both advice in marriage selection and for studying the inheritance of traits. Such a bureau actually exists in the Eugenics Record Office. The obvious necessity of depositing the family history in a central bureau, if it is to be available for eugenical purposes offers for many an insuperable obstacle. They may enjoy recording facts concerning themselves and other members of their family but they could not think of letting them out of their possession. I can sympathize with this feeling. One does not publish the details of one's family history, because, as society is at present constituted, certain of these facts might, if known, interfere with one's standing or advancement in one's social world. This is owing to the presence of scandalmongers and others of pathological and antisocial instincts who like to hold it up against one that he has certain limitations. The fact that the records are held as confidential ought really to meet this objection. And we may hope that society is nearly ready to take a saner view about one's personal responsibility for one's traits. I am in no way responsible for my racial traits, whether they are due to innate tendencies in development or to peculiar conditions of development, for over neither of these have I, in last analysis, any control. And what a strange spectacle does mankind exhibit, each hiding from others, as far as he can, his personal and family traits, like a lot of little children around a Christmas tree, each hiding from the others the gifts he has received lest it appear that his are not as good as another's. This attitude might be regarded as merely childish and trivial were it not that one's personal and family traits do not belong to oneself, but, in so far as one has, or hopes to have, children and grandchildren, they belong to society. For each one of us is a mosaic of racial traits that have come from a union of various germplasms in the past and some of which will pass into the germplasms of future generations, and organized society has a right to know the racial qualities of its human breeding stock, for organized society is the only agency to which can be entrusted the guardianship of the quality of the germplasm of the future. The scientific genealogy of the future will afford society that knowledge of the racial qualities of its breeding stock. Thus the value of scientific genealogy to humanity lies above all in this that it will make it possible to utilize a knowledge of the racial characters carried by the individual for the advancement of the race.

Chas. B. Davenport
Coldspring Harbor, N. Y.,
December 28, 1914

THE EUGENICS MOVEMENT AS A PUBLIC SERVICE

It is coming to be a commonplace statement that we have paid more attention to the production of high-grade breeds of sheep, cattle, swine, and so forth, than we have to that of effective human beings, and this statement gains popular strength as we awaken one by one to the fact that man is, after all, a member of the animal kingdom and subject to its laws. The idea that society should concern itself directly with the improvement of human offspring emanated, as you well know, from Francis Galton, and the movement thus initiated has for some time been known as the eugenics movement. In clearing the ground by way of preparation for actual work, the eugenist has made certain important discoveries. It appears that in many of our civilized populations to-day, the defective classes are increasing more rapidly than any other constituent of the community and that quite aside from the enormous cost that their care entails

upon the public at large, their very growth threatens our civilization with future submergence, if not with annihilation. With this condition confronting us, it behooves us to make every effort to ward off possible calamity, and it has, therefore, become a common duty for us to acquaint ourselves with the nature of the situation, to enquire into such remedies as have been proposed, and to support every measure, both private and public, that gives reasonable promise of staying and correcting an impending evil. In the time allotted to me, it is my intention to bring before you certain aspects of man's nature that seem to me of first importance in establishing a sound basis for passing upon such problems as I have suggested. I shall attempt this from the standpoint of a zoologist, not from that of a eugenist, for the obvious reason that I am not an expert in the field of eugenics. If I fail in this effort you must lay the blame at the door of the retiring vice-president of Section F, who in his kindly way has trapped me in a moment of unwariness for this occasion.

Although we are awakening to the fact that man after all is only one of the millions of animal species on the surface of the globe, we are also well assured that he is a species of very unusual character. The particular traits in which he differs from most other species are to be found in his social habits. As a community builder, a founder of civilizations, he is far in advance of any other animal. One of the results of his social activities in many communities has been the development of institutions for the preservation and care of his less fortunate fellows. Thus asylums, retreats, hospitals, and so forth, have been established by private munificence or public grants. More or less under the protection of these institutions has grown up a body of semidependents and defectives whose increase it is that excites the apprehension of the eugenists. That in the past such individuals have always formed a part of our race can not be doubted, but that they ever showed a tendency to increase comparable with what seems to be occurring at present is highly improbable. The occasion of this increase is not, in my opinion, merely the exigencies of modern civilization; it is at least in part due to the immense spread of humanitarian activities which have characterized the last century of our civilization.

That this increase of an undesirable stock should afford an argument against such humane activities is far from my meaning. To my way of thinking this threatening feature is indicative of a minor defect in the workings of modern humanitarianism, and its correction when discovered and applied will, I believe, put that movement on a stronger footing than ever before.

Biologically considered, the situation is described by a simple formula. Most of us have given up the idea that natural selection is a factor of prime importance in organic evolution. Its operations are not detailed enough to yield with any completeness the finished product as we know it in nature, an organic species. But most of us are also thoroughly convinced that selection is a real factor in the development of animals. Its function seems to be that of the elimination of the obviously unfit. As we look about in nature we meet on every side evidences of the ruthless destruction of the strikingly ill-adapted. Among the savage races, as among the lower animals, the defective individual meets an early end. It is only the humanitarianism of our higher civilization that reaches out and protects in a measure such members of our race. Stated biologically then it may be said that we as social beings have devised means whereby the slight effectiveness of natural

selection as seen among most organisms has been measurably checked for certain groups in the human species. Thus a class of individuals with undesirable traits so far as the community as a whole is concerned are beginning to make an alarming showing.

If the increase of defectives is due in large part to a certain restriction of natural selection, is the solution of this problem the reinstatement of that process by a removal of humane protection whereby the defective members of our communities would suffer an early personal removal? Not at all! In my opinion any step in the direction of a curtailment of social help to the defective individual is a step backward. No community can afford such a move. We are at present well enough equipped in our social provisions to extend to such persons a reasonable measure of protection and training whereby they can arrive at the fullness of their slight powers. And such a treatment of them is in my opinion the only right social course. But if society protects them against the attacks of unkind Nature, it is entirely within the rights of society to see that their numbers shall not increase. Such growth may well be the very undoing of society itself.

The increase of such individuals is an organic rather than a social matter; in some cases the defective is the unquestionable product of a disease-laden environment, but in most instances he is the offspring of a defective stock and his present condition is thus chiefly the result of inheritance. Natural selection would eradicate such a class of defectives by the elimination of the individual before he had reached the reproductive period. But society can accomplish this end in a vastly more humane way. It can surround the deficient individual with a reasonable environment and eliminate only his powers of reproduction. Modern biology and surgery have progressed far enough to make it reasonably certain that sterilization of both males and females may be accomplished with so little initial and subsequent disturbance to the individual, excepting in so far as his reproductive capacity is concerned, that no one can object seriously to this method when legally and humanely employed. Vasectomy in the male and salpingectomy in the female are operations for the removal of the outlet ducts of the reproductive glands and thus by checking the escape of genital products they very usually sterilize effectually the individuals operated upon. They are relatively simple surgical procedures. Since they leave the reproductive glands untouched, they do not involve the important question of internal secretions, and, as might be expected, they have practically no effect on the personality of those subjected to them. They are therefore in every way suited to the purpose at hand. Legislative action looking to their adoption has already been taken in several communities, but it is naturally slow in its accomplishments, for its support requires behind it a certain amount of public opinion that has not yet had time to crystallize. What some of us regard with impatience as over-deliberateness on the part of the public and legislators is undoubtedly due to their ignorance of the seriousness of the actual situation and of the simplicity and effectiveness of the remedies proposed. This part of the eugenics program in no sense contemplates an interference with the liberties of what may be called even a small part of the community. It has only a most limited application. The extent of this application is well expressed by the Whethams in their declaration that "except in the case of the feeble-minded, where state interference is glaringly overdue, probably in the case of hopeless habitual criminals, and possibly in the case of

sufferers from certain types of blindness and deaf-mutism, there is no direction in which, as yet, general interference would be justified.'' What is sought in this movement is that persons who are such radical defectives through heredity as to be in the nature of public wards should be rendered sterile by as innocuous a means as possible, for, as is well known, such half measures as segregation and the like are too often ineffective. Since society offers a reasonable protection to such individuals, it is, in my opinion, entirely justified in taking this step against those who through irresponsibility would inflict upon it additions to its already too lengthy list of defective members.

But the eugenist is not only concerned with the problem of a humane elimination of the unfit, he is also equally desirous of perpetuating and increasing the most highly gifted in the community. If the best workers and the best thinkers in all lines of modern human endeavor could reproduce their kind in the next generation to the exclusion of the incompetent and the vicious, civilization would make a stride in less than the span of a single lifetime such as it has never done before. The elimination of the strikingly defective members of society, as I have already tried to show, is a reasonable and a humane possibility. Is it also reasonable to expect that the second part of the eugenics program, namely, the reproduction in future of only the best at hand, is likewise biologically possible?

We can approach this question best by asking what constitutes high excellence in any member of the community. Such a member must have the physical qualifications for an ample life during which he must contribute more or less continuously to the welfare of society. He must be physically intact in that he can withstand the wear and tear of daily exertion, and meet successfully the strain of momentary crises; and he must cultivate a range of activities that yields products serviceable and acceptable to his community. Modern society has an ample supply of this type of human being and it remains to ascertain the source of his qualities and capacities and the means by which they are handed on to his offspring. The question resolves itself into one of the nature and amount of human inheritance.

On this point the facts gathered from animal breeding are most illuminating. Without this source of information, it would have been almost impossible to have formed any adequate idea of the nature of human inheritance. We know full well that the animal breeder has steadily improved his various stocks and that these improvements have become permanent heritable properties of the particular strains with which he has dealt. We also know that the work of the trained breeder is not a haphazard enterprise, but a well-directed effort in which the constancy of the product can be counted on with ever-increasing certainty. Once well established, a breed will reproduce itself under almost any circumstances with such completeness and fidelity that we scarcely think of the environment as in any way involved and we ascribe the results without further ado to inheritance. To get a Holstein cow we invariably draw from Holstein stock; we do not seek to create Holstein surroundings; and experience entirely justifies this procedure. To be sure, we recognize important effects from the environment. We all know that underfeeding or overfeeding will have an immediate influence upon growth, but we never turn to factors of this kind to change one stock into another. Holsteins are one breed and Guernseys are another, and their immediate characteristics are matters of inheritance, not of environment.

With this kind of information behind us, and with the growing conviction that man too is an animal, we naturally turn to the problem of populating the world with the feeling that if human reproduction were subject to only a little of the kind of control that the expert breeder exerts over his stock, the advance of the human species in social efficiency might be incalculably great.

But here I must invite your attention again and more closely than before to what constitutes an effective human being. Such a member of society is not only a person physically intact and capable of responding to all the requirements of an enormously complex environment, as the best of our domestic breeds do, but he is one who has gathered to himself an untold wealth of experience far exceeding that of any other animal. Moreover, he has not only within himself this vast store of riches, but he long ago devised an immensely complex system of extraneous records in the form of spoken and written languages by which experience could be preserved, handed on to others, and thus made available in a fashion wholly unique. With language came morals, the arts, science, in short all those features that make up civilization. Thus the older naturalists were justified in a measure in regarding man as a species separate from all the rest of creation, and even we must today admit his very unusual character. When we call to mind this vast array of activities so much more diverse, rich and voluminous than that of any other species, the problem of inheritance in man takes on a very different aspect from that in other organisms.

Although very little is known about the transmission of the enormously complex inheritance of human beings, there are in this process two fairly well established features. First, many qualities, some of which are of a more physical nature like the color of hair or eyes and others of a more functional character like resistance to disease or temperamental conditions, are known to be inherited in man in precisely the same way as the peculiarities of the lower animals are, that is, through the germ. Other possessions, such as language with all its social dependences, are handed on, not through the germ, but by a process of learning, a mode of inheritance which is only most scantily represented among the lower forms. These two types of inheritance, the one characteristic of most organisms, the other more peculiarly human, have gained especial attention in the last few years and have been designated organic and social inheritance, respectively. That they represent distinct and well-defined processes there can be not the least doubt, but what proportion of the total human inheritance is included in each is a matter of much uncertainty.

From the standpoint of genetics these two types of inheritance are of fundamental importance. Organic inheritance is the only kind that can be controlled through the reproductive processes, and its product when normal is the rich natural soil in which civilization flourishes. Social inheritance is the work of the educator, using that term in the broadest sense, and its product when normal is civilization itself. For success it depends first upon a proper organic soil in which to root, and next upon the cultivating influence of a civilized environment. So far as the individual is concerned social inheritance is essentially a process of learning and our whole educational system is devoted to its operations. Since we receive our social inheritance as an acquired character, to use a biological term, and not through the germ, we can be sure that it will never be converted into an organically heritable aggre-

gate. The most we can hope for is that through the operation of organic inheritance, a nervous equipment can be evolved that will enable us to accomplish formal education more effectually and in a briefer time than we do at present, but that the store of facts representing the experience of one individual will ever be transmitted through the germ even in part to another is inconceivable. The future child may receive through the germ increased facility for learning languages, but the words of any particular language can never reach it by this route. They must come to it through the ear or eye, as newly acquired characters, a social inheritance.

With this distinction of organic and social heredity in mind how must we picture the complete process of reproducing effective members of society. Not by purely educative means which often waste themselves on attempts at the improvement of an impossible stock, nor by the exclusive control of reproductive processes which seem to be able at most only to prepare the individual to receive his social heritage, but by a mutual operation of both lines of endeavor. I am aware that there are those who believe that all that society needs for steady improvement is a right alteration in the environment and that reproductive irregularities will then adjust themselves to the improved conditions, and I am also aware that there are others who think that the social control of human reproductive activities will lead most quickly to social efficiency and the environmental changes are without permanent significance. The latter view represents that of the animal breeder pure and simple and would be correct for man were it not that he inherits not only as the lower animals do, organically, but also socially. To distinguish in the daily life of a given individual what is organically inherited from what is social in origin is very difficult. Has the reformed drunkard become a useful member of society because of the advice he took or by reason of a natural power of resistance received through the germ? No one can tell, but many in this class assert that the advice, the social inheritance, saved them, and no ultra-eugenist has been able thus far to prove that such may not have been the case. With examples of this kind before us, it seems almost impossible to determine whether in human progress organic or social inheritance is the determining factor. And perhaps such a question is in reality futile. Both factors are surely at work in the world and in the infinite succession of events that go to mould a human being into an effective social organism, now one, now the other, probably predominates. Though we are not in a position to give the exact weight that should be ascribed to each of these two factors, we can be sure that the placing of all the weight on one to the exclusion of the other is a mistake. Both factors have shared in the production of effective human beings, and so far as we can see both are likely to continue to participate in this operation.

To conclude, eugenics in the service of society is, in my opinion, entirely justified in demanding the sterilization by humane methods of those defectives who are in the nature of public wards, and this practise may be extended as experience dictates. Eugenics in its relation to propagating the best in the community has a fundamental position in that it is concerned through the elimination of the extremely unfit with the delivery of a reasonably sound stock for cultivation, but it is only secondarily connected with the final production of efficient members of society whose real effectiveness is often more a matter of social inheritance than it is of organic inheritance.

HARVARD UNIVERSITY G. H. PARKER

PREPAREDNESS FOR PEACE

An intelligent and interesting presentation within a brief compass of the subject assigned to me, "Modern Methods of Studying the Mind," would require literary skill of such high order that with the chairman's permission we shall undertake the less ambitious task of considering a few generalizations, not technical descriptions of methods of studying the mind, of the same character as those which John Stuart Mill once described as "the common wisdom of common life"; and then try to determine whether the practical application of some of this knowledge would not to a certain degree remedy our present national unpreparedness for peace with honor.

By way of prologue let me remind you that although at least 100,000 years separate us from our Neanderthal ancestor, we have only just begun to take an intelligent interest in the mechanism of the human mind. Philosophers of antiquity as well as of the present have recorded their impressions of an idealized humanity, but the youngest of all the sciences is the study of the activities of living individuals; and the recent birth of this interest partially explains the pessimism expressed by those who have been rudely awakened by current events to an appreciation of the relatively slight progress made by civilization.

This year marks an important chapter in history. To-day the world pays a tax in blood on human ignorance. Protests are made and Heaven is implored to avert the logical consequences for our failure to obey the command "know thyself." Little did we appreciate how ignorant we are in regard to the foundations of character, and the factors that condition it. As our intelligence increases we shall gradually become quite as much ashamed of our ignorance of human nature as we are now shocked by the horrors of war. How do we intend to face the present crisis? Indulge in maudlin sentimentality, become more bitterly denunciatory, shut our eyes to the magnitude of the task and pray, or rise and acquit ourselves like men?

The problems of peace are more difficult to solve than are those of war. Intelligent belligerency represents a lower plane of mental activity than intelligent neutrality. A declaration of war is an indication of the present inadequacy of human intelligence to solve great problems. Shall we succeed or fail in our declared neutrality? In what direction shall we turn for assistance? The tax upon the brain power of the nation in preparing for peace will be greater than in preparing for war.

Is it rational to suppose that the correct answers to the great questions which now force themselves upon our attention will be given by diplomatist, statesman, social reformer, historian or any person who attempts to predict coming events merely by analyzing impressionistic records of human conduct? Should we not turn to those who are attempting to secure a comprehensive knowledge of the human brain, and its mechanism as expressed in character and conduct? "Declarations of war" and "treaties of peace" are the products of cerebral functions. As long as physicians attacked the problems of physiology from the historical point of view little progress was made in explaining the functions of individual organs; and equally futile have been the efforts of those who, ignoring the study of living individuals, go back to historical sources for their information and offer "these records of the dead" as interpretations of the synthesized activities of all the organs of the human body objectively represented in behavior or conduct. Is there any reason why we should be spared the ignominy of reaping that which

we have sown? We still look at the problems of living from a narrow historical point of view, describing its phenomena in terms borrowed from post-mortem records. The present tragedy of which we are spectators may in a double sense be called an historical drama, as it marks another one of man's failures brought about in the effort to apply his meager knowledge of the individual to regulate present politics by past history. One of the beneficent results of the application of modern biologic methods to the study of the mind has been the development of a sense of optimism based on the belief that the constantly growing interest in the study of living organisms is a foundation for the hope that human activities, as the laws governing their organization are more clearly revealed to us, may become subject to intelligent control.

Any rational attempt to become a nation more successful in cultivating peaceful arts than in developing a belligerent spirit predicates more thorough preparation than man has made to undertake the study and control of the mental mechanisms which give rise to obsessions, overvalued ideas, anomalous emotional reactions, jingoism and chauvinism. Never before has there been a greater necessity than the present one of extending our knowledge of the laws governing the activities of the mind. Temporary expedients for the preservation of the world's peace may be suggested by tribunals, senates and parliaments, but hope for the successful and peaceful solution of problems of vital importance to humanity depends primarily upon the success of man's efforts to attain a comprehensive knowledge of his own brain-power, and the methods by which this may be generated and controlled.

Among the signs of the times are evidences of a sentimental desire for peace, but on the other hand there are reasons for doubting whether our brain power is sufficient to attain and maintain conditions that are unfavorable for war. The enumeration of some of our national characteristics give rise to premonitions that in this crisis we shall with commendable promptitude and efficiency discharge our duties to sufferers abroad; and at the same time show an extraordinary disregard for the intelligent direction of many affairs at home. As a people we undoubtedly work best when under the strain of emotional excitement, and this tendency justifies great deliberateness in considering whether we are equal to the task requiring limitless stores of patience and an intelligence sufficiently developed to bring about conditions esential for the preservation of peace. In the interests of humanity it is desirable to distinguish very clearly between the logical thought-processes of intelligent, peace-loving people, and the sentiments of those who declaim against the horrors of war. There are certain innate qualities of the American mind which justify more than an occasional jog to our memories in order to recall the fact that intellectual judgments are largely determined by the character of the underlying emotional reactions; and yet without attempting to organize feeling or sentiment we complacently direct attention to our traditional capacity to look at the problems of life from a very practical point of view, and remain oblivious to the danger that exists in the constant repression of the sentimental side of our natures until some crisis increases the tension to such a degree that equilibrium can only be restored by an explosion.

We shall not be guilty of carrying our methods of introspection too far if we refer to the serious handicap to the cultivation of those qualities of mind which predispose toward the peaceable solution of im-

portant questions that is expressed in the national disregard for the biologic importance of good mental habits. We seldom stay at one task long enough to develop the habits essential for efficient and thorough work, and the same amateurishness characterizes our efforts whether they be in the field of diplomacy, road-building or in organizing a university. If we actually determine to lay substantial and rational foundations for peace, and not erect a temporary structure on the shifting sands of sentiment we should look below the surface for evidences of actual progress towards the realization of these aims; and find them expressed in such an undertaking as the endowment and organization of a great institute for the study of the brain and nervous system, in increased provisions made for research along similar lines in our universities, and in the establishment of departments of education with a view to training teachers to recognize the biologic needs of human beings; as well as in all those rational efforts made to extend or to put into practise our knowledge of the mechanisms by means of which human individuals adjust their lives successfully to the environment in which they live.

The folly of the mariner who goes to sea without a compass is not greater than our own in attempting to solve the problems involving the destiny of our race without any more definite knowledge than is yet possessed of the functions of the brain and nervous system. The optimistic views expressed by the eugenist in regard to the intellectual progress of the human race that will be brought about by selective breeding will be more rapidly realized as soon as we have collected sufficient data concerning the functions of the nervous system to determine what the desirable mental mechanisms are; as well as the nature of the factors conditioning the trends of the mental life. In reading history our attention is chiefly focused upon the behavior of large numbers of human beings, the crowd or mob, and we forget that the activities of the masses can not be interpreted intelligently until the reactions of the individual have been analyzed. History and anthropology can only become vital subjects and potent factors in directing the streams of civilization when interpreted by a more complete knowledge than we yet possess of the intricate mechanisms of the human brain. It is unnecessary to call attention to the fact that the accounts of man's interest in the investigation of hypothetical mental qualities are voluminous, whereas, the records of actual study of the minds of living persons are comparatively few and meager.

The progress made in the study of mental phenomena has been along two general lines. The different organs composing the human machine and their relations to each other have been made the subject of investigation, and in the second place by observation and by carefully gathering experience as to how the machine expresses its activities as a unit in behavior and conduct, a profitable and broad field of enquiry has been opened up. So dominated are many of us by the instinctive tendency to worship at a special shrine or bow down before a fetish that the absence of test-tube or induction coil in studying the problems of human conduct often leads to the supposition that the laws governing mental phenomena are less easily recognized than those conditioning the reactions taking place in a beaker or registered on a kymograph cylinder.

If we turn from trying to estimate the conjectural benefits that might follow the extension of knowledge of the brain to find some practical application for the relatively few facts already brought to light,

we shall be surprised that even this limited store of information has not been put to some practical use. Even in scientific laboratories by utilizing this information the conditions under which research is carried on could be greatly improved. Progress would be more rapid if scientific men estimated successful achievements not only by counting the number of new facts discovered by an investigator, but by measuring the dynamics of human nature and the character of the mental processes by which investigators attained their results. Occasionally the scientific atmosphere becomes so oppressive that we are justified in taking precautions so that anomalous emotional reactions, cynicism, moods of depression and exaltation, over-valued ideas, obsessions, paranoid trends of thought and the maniac's capacity for indulging in invective and controversy, as well as in depreciating the achievement of other persons, may be replaced by more desirable mental mechanism.

The importance of the early formation of desirable mental habits is a principle reiterated so often that it makes many moments unhappy ones during the copy-book age, but the practical application of the doctrine to increase our happiness and efficiency in living is almost ignored by the present educational system in America. A system of education based upon the vital principle that success in living should be measured by the ease with which the human machine works, and not by the amount of cargo stored in the hold, would be of incalculable benefit to our race.

No more effective demonstration that science is common sense at its best is needed than the justification derived from the modern methods of studying mental phenomena of making habit-formation the chief function of elementary teaching, and from this procedure follows a natural and not arbitrary division between school and university; the former would then be recognized as the place in which habit-mechanisms are carefully trained, and the latter a field for trying out under supervision the activities essential for independent thinking, and for offering encouragement to competent persons to contribute to the extension of human knowledge.

If the citizens of this country are animated by a sincere desire to maintain a condition of peace expressing the activities of virile manhood and not the idle dreams of those who are unable to protect themselves against aggression, a well-directed effort should be made to assist those potentially capable of intellectual leadership to develop their mental faculties to the maximum of efficiency. Although leaders of thought may now be classed as among the actual necessities of life, the atmosphere of the American university is distinctly favorable for the growth of dilettantism and mediocrity. These institutions suddenly find themselves called upon to do their share in bringing about a readjustment of civilization hampered by an organization continually modified to meet either the demands of alumni, who for purely sentimental reasons are disinclined to aid actively in carrying out the proposed transformation of college into university or the increasing number of protestations coming from the champions of a hysterical athleticism. The measure of our intelligence as well as capacity to control effusive sentimentalism may be readily gauged by the methods we adopt in attempting to transform the universities into centers from which a spirit of intellectual leadership may be disseminated.

One result of "the splendid isolation" of our universities from each other has been that a chain of fictitious values for both ideas and ideals is established that empha-

sizes to an excessive degree the importance of a single institution and fails to bring home to students the desirability of developing emotional reactions in connection with permanent motives. At an impressionable age the emotional life of college students is sharply focused upon the interests of a single institution and the general drift of the affective undercurrents is so rigidly determined as to make it exceedingly difficult for the individual later in life to cultivate a just sense of discrimination. The dynamic power of constructive imagination depends upon the organization of an individual's activities, so that there should be coordination of feeling, sentiment and volitional response; and it is just this principle upon which so much of the effectiveness of our intellectual efforts depends that is practically not represented in the organization of our universities; and the failure to make this provision often deprives this country of the fruits of the highest forms of intellectual activity.

Mental habits once established, and motives called into play can not as a rule be shifted later in life without seriously restricting the intellectual horizon by the forcible readjustment of the emotional balance; an adaptation which is none the less serious because the individual is not aware of the process. As long as universities are controlled largely by their own alumni and by boards of trustees representing the traditions, beliefs and parochialisms of a single institution it is hardly possible that these institutions will become centers in which the type of personality essential for creative effort in science, art, or literature will receive a hearty welcome or attain full citizenship. The influence of the continental university is often unfortunately restricted by racial prejudice and national boundaries, but the American university is pretty generally hemmed in by the much narrower parochialism of its own alumni.

May we not begin to let a little more oxygen into the university atmosphere so that the energy, enthusiasm and idealism of American life which is already being put to a world test may be wisely directed and not repressed or stifled. Harvard's Back Bay traditions, Yale's fixed belief in the value of New Haven's ideals, Columbia's complacent metropolitanism, Princeton's faith in imported culture, and Pennsylvania's homing instincts all mark commendable mental traits that have served a useful purpose; and probably these qualities would once again become active ferments if they were transferred to new media.

The following plan if carried into execution would probably tend to bring about conditions more favorable than those now existing for the liberation of the energy stored up within our universities, and which is so often wasted without any effort made to convert it into a creative force.

If each university tried the simple experiment of appointing a small number of consulting trustees, members of the faculty of rival institutions, to meet once or twice a year with the home-board they would bring into the discussion of academic problems that sense of perspective and of values which is now so feebly represented; and definite progress would also be made in preparing intelligently both to maintain peace and deserve respect. This change would be the equivalent of a public declaration of intentions to the effect that the universities were prepared to abandon their local traditions and prejudices, to substitute for particularism a sense of nationalism or even a broad world-spirit, and thus they would become more intimately identified with the intellectual life and spirit of our civilization; and then in good time, following the growth of these broader

interests, more intelligent sympathy and active support would be accorded to those who are endeavoring to extend the bounds of knowledge.

In the present world-crisis we are oppressed by the feeling that the old conceptions of truth have failed us, but our despondency is lessened by the realization of the progress which the efforts of investigators must bring when they are heartily approved, sustained and strengthened by universities fully awakened to the necessity for intellectual leadership in the development of the newer civilization.

STEWART PATON

JOHN MUIR

ON the day before Christmas John Muir, geologist, explorer, naturalist, author, joined the great majority. Though seventy-six years old there had been no apparent decay of his remarkable faculties. Nor was there any painful waiting for the end. Death found him almost in the midst of his literary activities, which he had laid aside for a brief interval in order that he might spend the Christmas holidays with one of his daughters in southern California. On the 27th of December a large concourse of friends gathered from near and far at his home near Martinez, California, to hear the last rites spoken over his remains. He was buried, beside his wife, under trees planted by his own hand, in the beautiful family burial-ground among the Alhambra hills.

John Muir was born at Dunbar, Scotland, April 21, 1838. He was the third in a family of seven children. His early education was received at the grammar school in Dunbar. When he was eleven years old his father emigrated with his family to the United States. They settled on a farm near Portage, Wisconsin. There he indulged to the full his fondness for the life of the wilderness. His book entitled "The Story of My Boyhood and Youth" gives a pleasing picture of this period of his life. He also developed an extraordinary aptness for mechanical inventions of various kinds. Some of these are described in the same volume. In due time he went to the University of Wisconsin. His university career is best described in his own words: "Although I was four years at the university," he wrote two years ago, "I did not take the regular course of studies, but instead picked out what I thought would be most useful to me, particularly chemistry, which opened a new world, and mathematics and physics, a little Greek and Latin, botany and geology. I was far from satisfied with what I had learned, and should have stayed longer. Anyhow I wandered away on a glorious botanical and geological excursion, which has lasted nearly fifty years and is not yet completed, always happy and free, poor and rich, without thought of diploma or of making a name, urged on and on through endless inspiring, Godful beauty."

It was in the early sixties that Muir started off on those wanderings that finally brought him to California. In the early seventies his first brief communications on Yosemite and the Sierra Nevada began to appear in San Francisco and eastern papers. Soon his articles began to be published in the *Overland Monthly, Harper's, Scribner's,* the *Century,* and the *Atlantic.* A *Reference List to the published writings of John Muir,* prepared by Professor Cornelius B. Bradley in 1897, contains the dates and titles of nearly one hundred and fifty such articles and communications. At that time he had published only one book, "The Mountains of California," which appeared in 1894. But in "Picturesque California," edited by him in 1888, he had contributed articles on "Peaks and Glaciers of the Sierra," "The Passes of the High Sierra," "Yosemite Valley," "Mt. Shasta," "Washington and Puget Sound," and "The Basin of the Columbia River." In the *Proceedings of the American Association for the Advancement of Science* he was represented by papers on "The Formation of Mountains in the Sierra" (Vol. XXIII.), and "The Post-glacial History of the *Sequoia Gigantea*" (Vol. XXV.).

It seems remarkable now that a man of such

outstanding ability as a naturalist and a writer should not have published his first book until he was in the fifties. But Muir found himself very gradually. He spent long periods in exploring and living among the mountains of the Sierra Nevada. On these trips he endured many hardships and fared very frugally. He made copious notes of all his observations and accompanied them with surprisingly exact and often beautiful drawings. His studies were chiefly of a geological, botanical and physiographical nature. The extent and effects of glaciation in the Sierra Nevada received his particular attention, and he was first among geologists to work toward conclusions, on this subject, which in more amplified form now hold the field.

John Muir was an inveterate traveler. During his earlier years he went on foot through parts of the southern states and Canada. In 1876 he had become a member of the U. S. Coast and Geodetic Survey and visited Alaska, where he made many canoe trips and explorations. The great Muir Glacier, which he discovered, bears his name. In 1878 he visited the Arctic regions on the U. S. *Corwin* in search of the De Long expedition, and in 1899 became a member of the Harriman expedition to Alaska. In 1903–4 he visited Russia, Siberia, Manchuria, India, Australia and New Zealand. In 1911 he made a trip up the Amazon in South America, and he went to Africa in 1912. All these travels were undertaken for purposes of study primarily, and served to enrich still further his large stores of knowledge.

The publication of his book on *The Mountains of California* made him known to the world as a writer of exceptional power. His vivid, easy, poetical style was wrought out slowly and with great care. He refused to be hurried in his work, and rewrote his chapters a dozen times if he thought he could improve them in point of expression. His second book, "Our National Parks," shows his literary style at its best. It appeared in 1901 and reflects his eager activity in the interest of forest preservation and the establishment of national parks and reservations. This was followed by "Stickeen, the Story of a Dog," 1909; "My First Summer in the Sierra," 1911; "The Yosemite," 1912; and "The Story of My Boyhood and Youth," in 1913. A book on his Alaskan explorations was practically completed at the time of his death.

A number of high academic honors came to Mr. Muir in his later years. Harvard University bestowed upon him an honorary M.A. in 1896; the University of Wisconsin an LL.D. in 1897; Yale University a Litt.D. in 1911; and the University of California an LL.D. in 1913. He was one of the founders of the Sierra Club, in 1892, and its president for twenty-two years. The outings for which this organization has become famous were due to his initiative. At the time of his death he was president, also, of the Society for the Preservation of National Parks, and vice-president of the California Associated Societies for the Conservation of Wild Life. It should be noted, too, that he was a member of the Pacific Coast Committee of the American Association for the Advancement of Science, charged with the task of preparing for the San Francisco meeting in 1915.

In the death of John Muir the world has lost one of the most remarkable men of our time. To the last he preserved the eager interest of a child in all the phenomena of nature. His unaffected simplicity and modesty remained unchanged, though fame literally wore a path to his door. He knew how to translate his enthusiasms into human benefits, for no American citizen did more for the establishment of national parks, and the conservation of the great forests of the west. In the concluding chapter of his book, "Our National Parks," his sentences are aflame with the passion of a Hebrew prophet who sees the vision of the coming age and its needs. It may be that the present generation is able to appraise justly the services of John Muir as a naturalist and explorer. John Muir the seer, the writer, the father and guardian of Yosemite, awaits the appraisal of a later and greater day.

William Frederic Badè

SCIENTIFIC NOTES AND NEWS

CHARLES EDWIN BESSEY, head of the department of botany and head dean of the University of Nebraska, distinguished as a leader in botanical research and education, past president of the American Association for the Advancement of Science, died on February 25, in his seventieth year.

ARTHUR VON AUERS, the eminent German astronomer, has died at the age of seventy-six years.

DIRECTOR W. A. CAMPBELL, of the Lick Observatory, president of the American Association for the Advancement of Science, has been elected a foreign member of the Swedish Royal Academy of Sciences, Stockholm.

THE William H. Nichols medal is to be conferred on March 5 on Dr. Irving Langmuir, of the research laboratory of the General Electric Company, at the meeting of the New York Section of the American Chemical Society. Dr. Langmuir will make an address on "Chemical Research at Low Pressures."

ON the occasion of the inauguration of Dr. R. B. von Klein Smid as president of the University of Arizona, the degree of doctor of laws was conferred on Dr. D. T. MacDougal, director of the department of botanical research of the Carnegie Institution, and on Dr. J. W. Fewkes, of the Bureau of American Ethnology.

DR. JOHN C. MERRIAM, professor of paleontology in the University of California, has been appointed to be chairman of a sub-committee on research work on the Pacific coast established by the committee of one hundred on scientific research of the American Association for the Advancement of Science.

DR. W. H. HADOW, principal of Armstrong College, Newcastle-upon-Tyne, and Sir Henry J. Oram, engineer-in-chief of the British fleet, have been elected members of the Athenæum Club, for distinguished eminence in science and public service.

DR. ADELAIDE BROWN, of San Francisco, has been appointed a member of the California State Board of Health, to succeed Dr. O. Stansbury.

DR. LEWELLYS F. BARKER, professor of medicine at Johns Hopkins University, Baltimore, was the guest of honor at the thirty-third annual banquet of the McGill Medical Society, Montreal.

DR. H. P. ARMSBY, director of the Institute of Animal Nutrition of the Pennsylvania College and Station, has been relieved of all undergraduate instruction and will devote his entire time to research in animal nutrition and to advanced graduate instruction.

THE board of trustees of Stanford University has elected to its membership Dr. Ralph Arnold, of Los Angeles, a graduate of the university, and has reelected Mr. William Babcock, a capitalist of San Francisco, and Mr. Charles P. Eells, a lawyer of San Francisco, whose terms recently expired. Dr. Arnold is the second alumnus on the board at the present time, the other being Mr. Herbert C. Hoover, who is now serving as chairman of the Belgian Relief Commission in London. Dr. Arnold graduated from the department of geology at Stanford in 1899, received his A.M. there in 1900, and his Ph.D. in 1902. For a number of years he was engaged in scientific work for the government, being for a time paleontologist of the Geological Survey and later in charge of the survey's oil investigations in California. For the last half dozen years Dr. Arnold has been engaged in private practise in the oil fields of the United States, Mexico and South America. He has recently been withdrawing from technical work to a considerable degree in order to devote himself more fully to research work in the field of paleontology.

MR. A. F. MEYER, associate professor of hydraulics in the University of Minnesota, visited Toronto in February to confer with Mr. Arthur V. White and appear before the international joint commission in connection with the Lake of the Woods investigation. Mr. Meyer is serving this commission as consulting engineer.

MR. JOHN BLACKSTOCK HAWLEY (Minnesota, '87), consulting engineer of Forth Worth, Texas, has been elected president of the Texas

Association of the Members of the American Society of Civil Engineers. At the recent annual meeting of the society Mr. Hawley was elected director.

Dr. T. C. Chamberlin, head of the department of geology in the University of Chicago, and formerly president of the University of Wisconsin, gave a series of lectures in the department of geology of the University of Wisconsin from February 15 to 19, in which he reviewed the Chamberlin-Moulton planetesimal hypothesis of the formation of the solar system, with reference especially to recent work in correlating terrestrial phenomena in the light of this theory. On February 18, Dr. Chamberlin gave a public lecture under the auspices of the Science Club of the University of Wisconsin on "Early Stages of the Earth's History."

Dr. Francis H. Herrick, professor of biology in Western Reserve University, addressed by invitation the legislature of the state of Maine, on February 25, on the subject of "The Preservation and Propagation of the Lobster."

Dr. Graham Lusk, professor of physiology in the Cornell Medical School, recently delivered before the Washington University Medical School two lectures entitled "The Basis of Animal Calorimetry" and "Metabolism in Diabetes."

Sir Charles Augustus Hartley, the distinguished British engineer, died on February 22, at the age of ninety years. Sir Charles devoted most of his career to hydraulic engineering and the improvement of estuaries and harbors for the purposes of navigation. In 1875 he was one of the committee appointed by the authority of Congress to report on the improvement of the Mississippi. In 1884 the British government nominated him a member of the international technical commission for widening the Suez Canal. He was a member of the congress that sat at Paris to decide on the best route for a ship canal across the Isthmus of Panama. He was engineer-in-chief and consulting engineer to the European commission of the Danube from 1856 to 1907.

As was noted in Science several months ago the California Fish and Game Commission is attempting to build up public sentiment as the most efficient means of conserving game. In pursuance of this policy the commission has begun the publication of a quarterly, *California Fish and Game*, which is designed to bring facts regarding game and game conditions to the people of the state. The motto of the publication is "Conservation of wild life through education." The second number of the periodical has just been issued. It contains articles relating to game in California, with departments for editorials, fishery and hatchery notes, conservation in other states, life histories of game birds and mammals, and the relation of wild life to agriculture. Full reports on the work and the monthly expenditure of the California Fish and Game Commission are also given. Dr. Harold C. Bryant, director of the newly formed bureau of education, publicity and research is editor of the periodical.

It is stated in *Nature* that in answer to a question as to typhoid in the army, asked in the House of Commons on February 8, Mr. Tennant, Under-secretary of State for War, said: "Of the 421 cases of typhoid in the present campaign among British troops 305 cases were in men who were not inoculated within two years. In the 421 cases there have been thirty-five deaths. Of these deaths thirty-four were men who had not been inoculated within two years. Only one death occurred among patients who were inoculated, and that man had been only inoculated once, instead of the proper number of times—namely, twice." Replying to criticisms against inoculation made by Mr. Chancellor in the House of Commons on February 9, Dr. Addison pointed out that in the South African war there were 58,000 cases of typhoid—more than an Army Corps—whereas in the great force now in France and Belgium, and after six months, including three months of atrocious weather, there have only been 421 cases among the troops. The total losses in South Africa were 22,000, of which about 14,000 deaths were from diseases and 8,000 of these were from typhoid.

THE *British Medical Journal* states that the hospitals of Canada have been severely affected by the war, and in Montreal it seemed as though the three principal hospitals might have to close their doors. A campaign among the 800 governors of the General Hospital produced $150,000 in two days, sufficient to meet expenses for the next two or three years. The appeal for funds for the Notre Dame and Western Hospitals has been equally successful, and they will remain open at least for some time to come. In Vancouver the staff of the General Hospital have voluntarily agreed to a reduction of from 5 to 10 per cent. in their salaries in order to help the board in its financial difficulties.

ON April 3, 1915, an examination will be held to provide an eligible list for the position of food bacteriologist in the Chicago office of the State Food Commission. The salary at present is fixed by law at $1,800 a year. The limits recommended by the State Civil Service Commission are $150 to $175 a month. The examination will be open to non-residents, as well as residents, of Illinois over twenty-five years of age. The duties of the position involve making bacteriological examinations (and interpreting the results of such examinations) of milk, ice cream, eggs, meat, tomato products, etc., in accordance with the dairy, food and sanitary laws. The applicant should be able to state his opinions briefly and accurately as he may be called upon frequently as a court witness. Education equivalent to graduation in science from a college of recognized standing is required, as well as some knowledge of anatomy, histology and pathology, and some training in animal experimentation. The statement is made from the State Food Commissioner's office that the person employed in this position will be given time to take work in the various medical schools or universities of Chicago so that he may acquaint himself with those subjects with which he is not thoroughly familiar.

ANNOUNCEMENT is made of the establishment for the year 1915–16 in Nela Research Laboratory, National Lamp Works of General Electric Company, of two fellowships in physical research to be known as the "Charles F. Brush Fellowships." These fellowships are offered for the coming year through the generosity of Mr. Brush who desires thereby to stimulate interest in industrial physics and to make it possible for young men to undertake research work in physics in the environment of an industrial plant. The Nela Research Laboratory will provide space and all necessary facilities, and will have general supervision over the investigations, which must be consistent with the normal activities of the laboratory.

FIRE in the national forests of the west in 1914 caused a loss to the government of not quite 340,000,000 board feet of merchantable timber, valued at $307,303, and of reproduction, or young growth of trees, valued at $192,-408, according to statistics just compiled by the forest service. There were 6,605 fires, of which only 1,545 burned over an area of ten acres or more. About 77 per cent. of all the fires did damage of less than $100 each. In addition to the losses suffered by the government, timber on state and private lands within the forests, totaling 228,008,000 board feet and valued at $175,302, was lost. The total area burned over was 690,240 acres, of which 310,-583 acres were state and private lands. Notwithstanding that it was an exceptionally favorable year for fires, on account of high temperatures, heavy winds and prolonged drought, the average loss per fire was $103, as against $131 in 1911, when there were only about half as many fires. Eighty-five per cent. of the total loss was caused by fires in Idaho, Montana, Oregon and Washington, where more than half the timber in all the national forests stands. Less than one tenth of one per cent. of this timber was affected. Of the 6,605 fires reported, 3,691, or 55.9 per cent., occurred in these states, and of the 99 fires causing losses of more than $1,000 each, 81 were in this region. Lightning was the chief cause, starting 2,032 fires; campers came next with 1,126, followed closely by railroad locomotives, with 1,110. Incendiaries lighted 470 and the rest were attributed to brush burning, sawmills, etc., or their origin was unknown.

UNIVERSITY AND EDUCATIONAL NEWS

The committee on education of the House of Representatives has reported favorably a bill establishing a National University in Washington. According to the bill an initial appropriation of $500,000 would be made. The university would be devoted to research and graduate work and no degrees would be conferred.

In its annual report to the board of education of New York City, Superintendent Maxwell urges the need of appropriating ten million dollars for elementary school buildings in order that all children may be accommodated. There is also said to be immediate need of buildings for high schools and for vocational schools.

Estimates for 1915 appropriations for the Massachusetts College and Station have been submitted for $313,300 for maintenance and additional appropriations as follows: Microbiology laboratory, $67,500; for the completion of the agricultural building, $122,500; new dormitory, $40,000; enlargement of the power plant, $30,000, and minor improvements, $10,000.

In view of the difficulties of foreign travel no fellows will be appointed by the Kahn Foundation for the year 1915–16.

Dr. Horace Grove Deming, for the past three years associate professor of chemistry in the Philippine College of Agriculture, has been appointed professor of chemistry and chief of the department in the University of the Philippines, filling the vacancy occasioned by the death of Dr. Paul Caspar Freer.

Dr. Andrew Hunter, formerly assistant professor of biochemistry in Cornell University, has resigned the position of biochemist, U. S. Public Health Service, in order to accept the chair of pathological chemistry in the University of Toronto.

DISCUSSION AND CORRESPONDENCE

THE HISTORY OF SCIENCE

To the Editor of Science: I desire to express my hearty commendation of Dr. Libby's paper in the "History of Science," published in Science for November 6, 1914. His paper is one of the pioneers in this new and interesting field of thought, and the expression of such ideas needs further encouragement.

It is apparent that the time is fairly well upon us to give some definite consideration to the value and place of the study of the "History of Science," in the curricula of our universities, colleges and technical schools.

That this study represents a strong reactionary movement from the over-materialistic and specializing tendencies of the age in all departments of human progress is evident, and this is especially true in the sciences themselves. This reaction finds its development in the present idealism in the German school of science, where the historical method in the study of the sciences, theoretical and empirical, has been practised.

Two other notable and interesting papers in the past have contributed valuable suggestions, emphasizing two essential pedagogic points of view. The first treated the cultural or intellectual values derived from the intimate understanding of the problems of nature through the scientific method, and the second the historical perspective in the study of the sciences. Dr. Geo. H. Mead,[1] of the department of philosophy, lays special emphasis upon the cultural aspect in the history of science. In the last paragraph of his article he says:

> There is certainly no agent that can carry more profound culture than the sciences, but our science curriculum is poor in what may be called cultural courses in the sciences, and the import of science for culture has been slightly recognized and parsimoniously fostered.

The value and importance of history as a subject, and as a method, in the ordinary culture courses can not be denied; therefore the study of nature or science with the historical basis is equivalent to a power twice as great. And when education as an instrument of progress emphasizes the cultural element, education then becomes a potent force in making and maintaining the civilization of the future.

[1] Science, N. S., Vol. XXIV., September, 1906, pages 390–97.

The second paper, by Professor C. R. Mann,[2] of the education department in the University of Chicago, advances the historical method in the teaching of science, and the fruitful consequences to be brought about.

Some few years ago the writer undertook a study similar to that of Dr. Libby regarding the value of the history of science for the undergraduates of our colleges, and the replies which came from many prominent men in science, education and philosophy were most encouraging. These letters brought forth a universal affirmative reply regarding the value, importance and the future of the subject, and in general substantiated the arguments of the three papers named. To quote from a letter of Dr. Libby, in which he quotes from some one in authority, "the history of science is the very next essential thing in the development of technical education." Possibly the progress has been slow because there exists no satisfactory text-book on the subject in this country. Professor Tyler and Professor Sedgwick,[3] of the Massachusetts Institute of Technology, throw a much needed and encouraging ray of light to workers in this field.

In this country at the present time a number of our universities, colleges and technical schools are offering history of science courses in one way or another. Foremost of these are the universities of Chicago, Harvard, Michigan, Columbia, California, Stanford and the Massachusetts Institute of Technology. There are apparently two types of courses in the history of science, or two methods in treating the subject, namely, the history of a single subject such as physics, chemistry, etc., which is found in most schools; the second type is represented by the course given at Harvard. This is a general or combined course, three hours through the year being divided into physical and biological sciences. This is also conducted as a separate group of studies, thereby giving it more value or importance, and has now been offered for four years by Dr. L. J. Henderson, of the chemistry department. Personally, I believe it is the most satisfactory method in treating such a study as a course, although it depends upon the point of view one takes.

The University of Chicago offers in addition to its separate historical courses of individual sciences, a series of courses in the department of philosophy on the history and development of ancient and modern scientific concepts, which is apparently closely allied to the history of science.

The writer is at present preparing a paper upon the "Present Status of the Teaching of the History of Science in Our Universities, Colleges and Technical Schools." This study will involve a statistical account and comparison of the different courses given in the history of science, the number of hours of lectures, method of treating the course, and other facts bearing upon the tendencies and progress of this subject.

It is encouraging to note that while the bibliographical material upon this subject is very meager, in this country at least, yet sufficient has been accomplished to enable a fair beginning to be made for a working basis. The John Crerar Library, Chicago, has done more than any other agency in developing this important phase. Of course there are a number of foreign bibliographies or catalogues, such as *The International Catalogue of Scientific Literature,* London, *Institute International de Bibliographie* (science section), Zurich, *Bibliographie der Deutschen Naturwissenschaftlichen Literatur,* Berlin, and the *Bibliotheca Mathematica, Zeitschrift für Geschichte der Mathematischen Wissenschaften,* Leipzig.

In France the Paris Academy of Sciences offers each year a prize of two thousand francs for the best essay, memoir or book, original or translated, upon a general or specific subject in the history of science. The most notable instance was when in 1911 the Prix Binoux was awarded to M. Antonio Favaro, the great Italian historian of science, for the publication of the works of Galileo Galilee, and to M. Edmond Bonnett for his "Notes and Memoirs Relative to the History of the Sciences."

[2] "The History of Science, An Interpretation." *Popular Science Monthly,* Vol. 72, April, 1908, pages 313–22.

[3] "The Teaching of the History of Science," SCIENCE, January 1, 1915, pages 26–27.

It is to Germany, however, that the most credit belongs for the development and the work in this field. The number of very excellent texts and treatises in the history of science in Germany is far beyond the production in any other country. German scholarship is here again manifested in both quantity and quality, and Der Deutschen Gesellschaft für Geschichte der Medizin und Naturwissenschaften, organized in 1902, Leipzig, is probably the only organization devoted to the study and fostering of the history of science. The *Mitteilungen* contain a most complete and valuable bibliographical record of articles, memoirs and books in print, also containing originals and translations of historical treatises in science.

Two other publications worthy of notice at this time are the *Archiv für die Geschichte der Naturwissenschaften und der Technic,* Leipzig; and *Isis, Revue Consacrée à l'Histoire de la Science,* published in Belgium (or was published).

In closing, it would seem that in order to lend encouragement and force to aid this new field of investigation great good ought to come from an organization of a section in the American Association for the Advancement of Science, known as the History of Science section.

Frederick E. Brasch
Stanford University,
January 16, 1915

SCIENTIFIC BOOKS

The Home of the Blizzard, being the Story of the Australian Antarctic Expedition, 1911–1914. Sir Douglas Mawson, D.Sc., B.E. J. B. Lippincott Co. Illustrated, also with maps. $9.00 net.

It was thought by many that the acme of antarctic interest had culminated in the record-breaking sled journeys of Shackleton, the attainment of the Pole by Amundsen, and especially in the pathetic tragedy of Scott's latest expedition. It is encouraging to find in the records of Mawson's non-pole hunting explorations novel lines of human endurance, of tragic disaster, and of historical reversion, combined with scientific researches of value to the world. These physical and moral results exacted from the explorers not only the fullest effort of body and mind, but they also obliged the chief, returning as by miracle from death, to face a deficit of nearly $40,000 to pay for his privilege of polar service.

Mawson's expedition, which had the financial support of the Australasian governments, looked to the exploration of antarctic lands in the Australian quadrant—from 90° E. to 180° E.—and their occupancy for scientific observation and research. An intermediate station, wireless equipped and weather observing, was established on Macquarie Island, 850 miles south-southeast of Hobart. Circumstances restricted the parties for the continent of Antarctica to two—the main base at Commonwealth Bay, 67° S., 143° E. occupied by Mawson and 17 men, and the west base on the Shackleton Oceanic Icecap, 66.7° S., 97° E., established by Dr. Frank Wild and 7 men, in January, 1912.

Scientific work was carried out along the principal lines of geographic exploration, geology, biology, meteorology, glaciology, oceanography and magnetism.

Geographic Exploration.—From Mawson's base journeys aggregating 2,400 miles were made, in which King George V. Land was discovered and explored between 138° and 152° E., and from 67° to 70° 30′ S. In one journey a nevé bridge broke and Lt. Ninnis with team and sledge were fatally precipitated into a crevasse hundreds of feet deep, where they disappeared from sight. Mawson and Dr. Mertz were thus stranded over 300 miles from the station, with 6 wretched dogs and food for a week. Manfully accepting the situation, they struggled amid blizzards over frightfully rough ice, killing and eating their dogs as they failed to work. Mertz died of exhaustion 100 miles from home, towards which Mawson struggled in the last stages of bodily weakness, escaping as by miracle through an indomitable will, physical endurance and the finding of a chance cache set up by a search party. From the western base Wild's party discovered and explored Queen

Mary Land, between 101° 30′ E., and Gaussberg, Kaiser Wilhelm II. Land, in 88° 45′ E. By ship and sledge the coast was traced through fifty-five degrees of longitude, and with previous discoveries it is now certain that the continent of Antarctica extends continuously from 86° E. eastward to 158° W. longitude.

At sea Captain Davis discovered Mill Rise, a submarine ridge in about 47° S., south of Tasmania, and Jeffrey Deep, varying from 2,500 to 3,100 fathoms, approximately between 36° to 46° S., and from 110° to 125° E. He also located the continental slope of Antarctica through 55° of longitude.

Magnetism.—Besides regular work at the base stations, field observations were made by each sledge party. The strenuous effort to reach the South Magnetic Pole barely failed by a scant margin of about fifty miles. The party turned back from 70° 36.5′ S., 148° 10′ E., where the dip was recorded at 89° 43.5′, the Magnetic Pole being yet to the southeast.

The standardization of instruments by the Carnegie Magnetic Foundation, and the reduction and treatment of the observations by Dr. Bauer ensure more accurate and definite results than have been before attained. When such discussion appears it is certain that the present conflicting theories regarding the south magnetic pole will be satisfactorily harmonized.

Geology.—Although Antarctica is so covered by ice-caps as to confine geological researches to rare inland nunataks and infrequent stretches of ice-free coast cliffs, yet the general features of both King George and Queen Mary Lands were determined. Abundant red sandstones suggest that the Beacon sandstone formation, with dolorites, associated carbonaceous shales and coaly strata, extend from Adelie Land eastward to Ross sea region. On King George Land, Aurora nunatak, 1,100 feet high, disclosed "highly quartzose gneiss with black bands of schist." Horn Cliff, over 100 feet high had basaltic columns of dolorite 180 feet high.

> The beacons were found to be part of a horizontal, stratified series of sandstones underlying the igneous rock. Bands of coarse gravel . . . were interspersed with seams of carbonaceous shale and poor coal. . . . Several pieces of sandstone were marked by black, fossilized plant remains.

Near Penguin Point, 300 feet high, "the rock was coarse-grained granite, presenting great vertical faces."

In Queen Mary Land, Madigan nunatak, "the rock was of garnet gneiss, traversed by black dykes of pyroxene granulite;" Avalanche Rocks, 600 feet high, "rock mainly composed of mica schists and some granite;" Ross nunatak, "The rock was gneiss, rich in mica, feldspar and garnets;" Bar Smith nunatak rocks "were granites, gneiss and schists." Off the coast in dredging

> Fragments of coal were once more found: an indication that coaly strata must be widely distributed in the Antarctic.

A meteorite was found on the main ice-cap.

Meteorology.—The dominant characteristic of the climate of Adelie Land were the blizzards, which give the title to Mawson's volumes. He says:

> Such wind velocities as prevail at sea-level in Adelie Land are known in other parts of the world only at great elevations. The average wind velocities for our first year proved to be approximately fifty miles per hour.

Hourly records of one hundred miles were not very unusual, and gusts approximating 150 miles per hour were experienced. On May 15, 1912, the average velocity for the 24 hours was ninety miles. Later the reviewer hopes to comment on these remarkable meteorological conditions.

Biology.—Flora is practically non-existent in Antarctica, the brief list being mosses, lichens and algæ. A growth of lichens on red sandstone is reproduced in color as "an example of the most conspicuous vegetation of Adelie Land." As might be expected, the most luxuriant growths were in penguin rookeries. On Gaussberg were "large quantities of moss." Most interesting were the tiny, eye-visible insects found, especially on Horn Bluff, where among the many patches of moss they were caught in myriads. Fresh-water lakes produced low forms of life, mainly microscopic.

Among these were diatoms, algæ, protozoa, rotifera and bacteria.

Bird life was the striking feature of living nature; penguins, petrels, skuas and a new species of prion. Most interesting are the accounts of incubation, nesting, fishing, etc., of the various species. Eggs of practically every variety were obtained, including those of the silver-gray and antarctic petrels, previously unknown. The emperor penguin is the sovereign bird of Antarctica, and both eggs and rookeries are almost unknown. On Haswell Island, off Queen Mary Land, was found a large rookery of the emperors.

> The Emperor penguins had their rookery on the floe, about a mile from the island. The birds covered four to five acres. . . . We estimated the numbers to be 7,500, the great majority being young birds.

Near by was found a large rookery, about 300 birds, of antarctic petrels nesting in gullies and clefts, laying their eggs on the shallow dirt, each having one egg. This island appeared to be a bird's paradise, as there were also large numbers of Cape pigeons, Southern Fulmars, Wilson petrels and snow petrels, while skuas also were present. Of 26 species of birds obtained 6 were penguins, 3 albatross and 7 petrels.

Seal life was abundant during the summer season, consisting of the seal elephant, sea-leopard, Weddell seal, crab-eater seal and the rare Ross seal, of which 6 specimens were obtained. The blue and killer whales were the only varieties observed. Space fails in which to dwell on interesting observations made of bird and of seal life, as well as to the rich and varied marine life procured both by shore-dredging and by deep-sea dredging at 11 stations in depths reaching 1,800 fathoms, and of tow-nettings down to 200 fathoms. The rich fauna and interesting flora of Macquarie Island will prove interesting to scientists. Among these the most important are the rookeries, the sea-elephants having some 500 cows in the largest, the king penguins about 6,000, and the royal penguins covering 26 acres of ground, approximately nearly half a million, as 150,000 birds are killed annually.

Glaciology.—The lands of Adelie, King George and Queen Mary are buried under thick glacial ice, through which protrude rare and small nunataks (ice-free peaks). Not only is the land thus covered, but the continental ice-caps project seaward along the entire coast-line to a greater or less extent. These projections, named by Ross *barriers,* and styled *shelfs* by Mawson, are actually *oceanic* ice-caps. In King George Land Mertz and Ninnis glaciers push seaward indefinite distances, demarcation between land and ocean being undetermined, but each covers more than a thousand square miles of the Antarctic ocean. More remarkable is the Shackleton oceanic ice-cap which covers some 36,000 square miles of the ocean, its dimensions being 180 miles north and south by 200 miles east and west. Its surface extent is approximately equal to the combined areas of the states of New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut and New Jersey. Rising about 100 feet above the sea, its average thickness can not be less than 600 feet. Special interest attaches to the so-called ice-falls, where glaciers of very steep pitch impinge on the oceanic ice-caps, the Denman glacier being an example. Of this Dr. Wild says:

> Denman glacier moving much more rapidly than the Shackleton Shelf, tore through the latter and shattered both its own sides and also a considerable area of the larger ice-sheet. At the actual point of contact was an enormous chasm over 1,000 feet wide, and from 300 to 400 feet deep, in the bottom of which crevasses appeared to go down forever. The sides were splintered and crumpled, towering above were titanic blocks of carven ice. The whole was the wildest, maddest, grandest thing imaginable. . . . Rending the Shackleton Shelf from top to bottom, it presses onward. Thus chaos, earthquake and ruin.

Other polar publications in recent years have been as sumptuously illustrated as are these beautiful volumes, but here is to be noticed a welcome restriction of personal photographic exploitation. The varied experiences of Mawson and of his subordinates, the wealth of sea-life and of bird-fauna, the immensity and peculiarity of glacial forms, have been wisely

utilized for several hundred illustrations which generally are of both popular and scientific interest. Of the 70 views of birds, seals and sea-elephants scarcely one could be spared. The bird-lover finds penguins and petrels of all ages and conditions; the sea-rover will delight in the scenes of seal and sea-elephant life; the meteorologist notes graphic records of winds and blizzards; the biologist sees prophetic shadows of the riches of later scientific publications; and the geologist finds pictured nunataks, columns of dolorite and cliffs of granite. The volumes will be welcome additions to scientific as to other libraries. The index is neither good nor full. Unfortunate was Sir Douglas in the "literary style" due to his associate, as shown in the foreword and by interjected poetry, which mar the dignity of the story of a great and historic expedition.

It is pleasing to find Sir Douglas Mawson in that restricted class that has a due sense of obligation to predecessors. After praising the skill and daring of Wilkes in the hazardous voyage of his squadron for 42 days along the borders of the antarctic circle, he adds:

> It is wonderful how much was achieved. We may amply testify that Wilkes did more than open the field for future expeditions.

Americans thus owe a debt to Mawson, whose faith, courage and ability have given definite form to the 1,500 miles of the continent of Antarctica, which was reported by Wilkes only to be contemned and suppressed in narratives and on charts, and to be absolutely neglected by explorers for seventy years.

A. W. GREELY

The Lower Amazon. By ALGOT LANGE. New York, G. P. Putnam's Sons, 1914. 8°, ill., 460 pages.

Mr. Lange's new book shows a great advance over his earlier work entitled "In the Amazon Jungle" published in 1912. He has evidently learned the Portuguese language, a thing so many other travelers seem to regard as quite unnecessary, and he has apparently reached the wise conclusion that one does not need to go deep into the forests of the upper Amazon in order to see and to learn interesting things. The experiences described by the author were confined mostly to a trip up the Tocantins, but without reaching the region of falls, another up the Mojú a short distance above the lower falls, and another to the Ilha do Pacoval in Lake Arary—all of them near Pará.

Personal experiences are related and illustrated by good photographs taken by the author, while the maps add greatly to the interest of the book. The author has a facile and attractive style, and no one has ever described more truly or more pathetically the poverty, sickness and despair that hang over the villages and rubber camps of the Amazon region.

In spite of the fact that he does not take kindly to the food of the country, the author is no longer a tenderfoot.

From a scientific point of view there is nothing new in the book. The ancient pottery from Marajó, on which he justly lays stress, has been known to the scientific world since 1870, when it was visited by Dr. Barnard, of Cornell University, and a paper on it was published by Hartt in the *American Naturalist* for July, 1871, while a much fuller account of it is given in the *Archivos do Museu Nacional* of Rio de Janeiro, Vol. VI., Rio, 1885.

Those who want to know how the conditions of life and of business in the Amazon Valley appear to one who is personally and freshly familiar with them will find much of interest in the final chapters regarding the conditions, prospects, food, health, and what the government is doing for the people. Those who believe in the boundless agricultural possibilities of the lowlands of the Amazon should read what is said at pages 27 and 387–8 of the great, enormously expensive, and tragic experiment of a North American firm on the Mojú, and the footnote about its final abandonment.

It is a relief to find a book necessarily containing many Portuguese words with so few typographic errors. On the other hand, it is not clear why the author always uses the Spanish word "machete" for forest-knife, or why he speaks of his men as "bucks." The long accent so often used by him on Portuguese words is not Portuguese at all: in the

cases observed it should be replaced by the acute accent. A few words are habitually misspelled, probably because they are not given in the smaller dictionaries: such as *cachassa* for *cachaça, meruhim* for *marui, tracachā* for *tracajá* (111), *chibēh* for *chibé* (115).

John C. Branner

Stanford University

BOTANICAL NOTES

ANOTHER APPLIED BOTANY BOOK

We have become so accustomed to looking for a new book, or a new revision of one of his earlier books by Professor Doctor Henry Kraemer, that it will not be a surprise to receive the announcement of another big volume of over eight hundred pages. In this book, which he calls "Applied and Economic Botany"[1] he has in mind the needs of students in technical schools, and agricultural, pharmaceutical and medical colleges. At the same time the work will prove itself to be a valuable reference book for chemists and food analysts, while students in morphological and physiological botany will find much that is helpful in its pages.

In carrying out his plan for making the book useful for these various classes of persons the author wisely first makes a rapid survey of the plant kingdom from Schizophytes, Algae, Diatoms, Fungi and Lichens to Bryophytes, Pteridophytes, Gymnosperms and Angiosperms. With this preparation the student is next given a good course in elementary cytology and histology, bringing the text up to page 298, where one finds a chapter on the outer and inner morphology of higher plants. A short chapter on botanical nomenclature must be especially useful to the particular students for whom the book is designed, as it gives a few of the general laws of nomenclature, and follows these with twenty-nine pages in which over eight hundred botanical names are enumerated and their derivations briefly given.

The three remaining chapters are given to the classification of angiosperms yielding economic products, the cultivation of medicinal plants, and microscopic technique, including reagents and their use. They all have a strong pharmaceutical bias, and yet the student in an agricultural college will find in them very much that will be helpful to him, more, probably, than in many of the books that have a more distinctly agricultural label.

It should be said that while there are many paragraphs and illustrations in this book that are identical with the author's fourth edition of his "Text-book of Botany and Pharmacognosy,"[2] published four years ago, this book is distinct from that, and appeals to a much wider circle of botanical students.

CYBELE COLUMBIANA

Under this title Dr. Edward L. Greene issues a 56-page pamphlet as No. 1, Vol. I., of a new botanical periodical which bears the date of December, 1914. Although it is known that the editor's address is Washington, D. C. (Smithsonian Institution), the publishers are given as Preston & Rounds, Providence; William Wesley & Son, London, and Oswald Weigel, Leipzig. Nor is there a statement of a subscription price, but it is stated on the title page that the price for this part is seventy-five cents, from which one may infer that the cost of the volume may be about three dollars. The same title page also informs us that this is to be "a series of studies in botany, chiefly North American," by the editor, "with occasional articles by others."

This first number opens with six pages of inimitable "explanatory," with reference to the title in which it is intimated that this is likely to be a violet periodical. This suggestion is borne out by the second paper on the "Violets of the District of Columbia, I." (pp. 7–33). Other papers are "Manipulus Malvacearum" (pp. 33–36) by the editor, and "Twelve Elementary Species of *Onagra*" (pp. 37–56, with 5 plates) by H. H. Bartlett.

Of course every systematic botanist will welcome Cybele Columbiana.

[1] Published by the author, 145 North Tenth St., Philadelphia, 1914. $5.

[2] Lippincott, Philadelphia, 1910.

SHORT NOTES

MR. PAUL B. SEARS publishes an interesting account of the "Insect Galls of Cedar Point (Ohio) and Vicinity" in the December number of the *Ohio Naturalist*. It is accompanied by four plates in which every gall (63 in number) is figured.

DR. M. T. COOK'S "Report of the Pathologist" of the New Jersey Agricultural Experiment Station, for the year 1913, contains a useful annotated list of the most common diseases of the year, arranged alphabetically by hosts. Apples and potatoes had the most diseases (13 and 12), with sweet potatoes following close with 9, and tomatoes with 7.

DR. G. H. SHULL continues to publish plant-breeding papers, as "Sex-limited Inheritance in *Lychnis dioica*,"[3] and "A Peculiar Negative Correlation on *Œnothera* Hybrids."[4]

HERE may be favorably mentioned A. G. Vestal's "Prairie Vegetation of a Mountain-front area in Colorado"[5] with eight good half-tones and a physiographic map of the region studied (near Boulder).

IN the January number of the *American Naturalist* Professor E. C. Jeffrey publishes a vigorous criticism under the title "Some Fundamental Morphological Objections to the Mutation Theory of De Vries." The writer concludes that "hybridism is the best explanation yet put forward of the peculiar conduct of *Œnothera lamarckiana*, as well as other species of the genus in cultures." Apparently this is also the conclusion reached by Professor B. M. Davis in the same number of the *Naturalist* in his article "Professor De Vries on the Probable Origin of *Œnothera lamarckiana*."

Two new botanical journals, *Journal of Agricultural Research* and *American Journal of Botany* merit favorable notice here. The first is published by the United States Department of Agriculture, and the second is the official publication of the Botanical Society of America. The first is by no means wholly botanical, and yet the articles dealing with plants, while tinged by some economic coloring, are of interest to the scientific botanist also. The second has taken high rank from the first in the literature of scientific botany. Its office of publication is the Brooklyn Botanic Garden.

IT inspires hope to find that the "part" of the "North American Flora" which appeared December 31, 1914, is the first part of the final volume (34), but this hope of early completion is much dampened when we find that this part brings the total number of pages now printed up to about 2,000, which is only about one ninth of what the whole work will contain. It would not be fair, however, to estimate that since it has taken more than nine years to print this much (one ninth) it will require nine times as long, *i. e.*, about one hundred years, to complete the Flora, for it must be remembered that authors have been at work on most of the volumes for the past ten years, and that we shall soon have a rapid appearance of successive parts. This particular part, which is principally from the hand of Dr. Rydberg, begins the tribe *Helenieae* of the family *Carduaceae*, and carries it into the tenth of the fourteen sub-tribes.

CHARLES E. BESSEY
THE UNIVERSITY OF NEBRASKA

[3] *Zeit. of induktive Abstam. u. Vererb.*, Bd. XII., Heft 5.

[4] *Jour. of Genetics*, Vol. IV., No. 1.

[5] *Bot. Gaz.*, Vol. LVIII., No. 5

SPECIAL ARTICLES

A FOURTH MALLOPHAGAN SPECIES FROM THE HOATZIN

THE hoatzin is a curious, rather pheasant-like, South American bird, which is the only species in the strongly aberrant family Opisthocomidæ, a family that is usually even ranked as a distinct avian order. This order or family, which is to say, this bird, has long been and still is a puzzle to the classifying ornithologists. Its genetic affinities are quite uncertain, although the approved general practise of the bird books is to put the family into a pigeon-hole next to that of the pheas-

ants or the pigeons, and close to that of the rails. But the hoatzin also shows certain affinities with the plantain-eaters (Musophagidæ) and even, as Beebe points out, with the primitive lizard-tailed bird of the Upper Jurassic slates of Bavaria, the famous *Archæopteryx*.

In 1909 I had the welcome opportunity of examining a number of Mallophaga taken by Mr. C. William Beebe, curator of birds in the New York Zoological Park, from a hoatzin in Venezuela (its native land). I hoped these parasites might afford some clue to their strange host's genetic relationship, in that, if the Mallophaga proved to be kinds characteristic of pheasants, or, indeed, of any other group of birds, this fact might be advisedly taken into account by the systematic ornithologists. For it is quite certain that in many cases the host distribution of the Mallophagan parasites of birds *is* determined primarily by the genetic relationships of their hosts.

The Mallophaga of the hoatzin, representing three species of the parasites, did indeed prove to be characteristic—but, unfortunately, characteristic of the hoatzin! Two were new species, one a *Lipeurus* and one a *Colpocephalum,* belonging not at all to pheasant-infesting groups of *Lipeurus* or *Colpocephalum* species. Indeed the hoatzin's *Lipeurus* manifestly belongs to a group whose other members infest exclusively maritime birds, while the *Colpocephalum* also shows a likeness to two other species of the genus taken from maritime birds, although it is also rather like a third species described from a francolin (African partridge). The third species, a *Goniocotes,* is also recorded only from the hoatzin—Nitzsch found it on the bird fifty years ago—but it is of a genus which is otherwise almost restricted to pheasants. To this extent, and this only, did the parasites of the hoatzin as recorded by me in 1910[1] offer any suggestions as to the taxonomic position of the host.

I have recently had the opportunity of examining a fourth Mallophagan species from the hoatzin. In a collection of Mallophaga miscellaneously taken by Robert Cushman Murphy, of the Brooklyn Institute Museum, in recent years in various places, I find five specimens of a *Læmobothrium* recorded as taken from a hoatzin on the river Orinoco in Venzuela (date not given). Three of the specimens are immature, but two are adult and represent both sexes.

The extraordinary thing about this *Læmobothrium* of the hoatzin is that, although it has been described by Cummings (Bull. Ent. Research, Vol. IV., p. 43, 1913) of the British Museum as a new species it is certainly very closely related to an already known species described under the name *L. setigerum* by Piaget in 1889 from the Cayenne ibis (*Ibis cayennensis*) which is a native of the same general geographic region to which the hoatzin is confined, namely, South America from the Amazon northward. Indeed, my own judgment is that the hoatzin's parasite should rather be called a variety of this species than the representative of a new one. *Læmobothrium setigerum* is a striking Mallophagan species, well-characterized by a group of curious, heavy, flattened and broad, short, spine-like hairs projecting forward from the clypeal margin, and it is certainly a parasite of ibises and cranes, for I have recently described two other varieties of the species from other ibises. One of these varieties, *L. setigerum* var. *africanum,* came from *Theristicus hagedash* from the Kilimandjaro region of East Africa (collected by Sjötedt's Swedish Expedition to Kilimandjaro-Meru), and also from the same host taken near Mfongosi in Zululand by a collector for the Durban (Natal) Museum. The other variety, *L. setigerum* var. *cubensis,* came from a courlan (*Aramus giganteus holostictus*), from Cuba, collected by Mr. C. D. Ramsden.

It is interesting enough to find a single striking Mallophagan at home on a Cayenne ibis of South America, a wood ibis of East Africa and a courlan of Cuba, but the interest becomes excessive when a closely allied species is found on the hoatzin in Venezuela. Is the hoatzin, after all, less of a pheasant or

[1] *Zoologica,* Vol. I., pp. 117–21, Figs. 38 and 39.

a pigeon and more of a water bird than commonly held? It does indeed, as observers have repeatedly pointed out, have a habitat and habits not unlike those of such water-liking birds as ibises and rails. It inhabits trees and undergrowth along rivers and in marshy regions. It makes nests usually in trees over water. The nests are also, says Beebe, the most recent and most careful observer of the habits of the strange birds, hardly distinguishable from those of the guinea herons, and built in the same situations. But all this may, of course, mean nothing as to the bird's phylogeny.

The suggestion that may come from some that my specimens of *Læmobothrium* from the hoatzin may have come to this host from some Venezuelan ibis or heron host by natural straggling is extremely unlikely for Mallophagan individuals of different bird species. This is only recorded, and practically only possible, among individuals infesting two bird sorts that consort gregariously in considerable numbers and closely. This is not true of the hoatzin, as Beebe's observations make clearly evident. Mallophaga are in only rare instances, outside perhaps of crowded hen-houses and chicken yards, colonies of chimney swifts or swallows, and places of common roosting or other foregathering of many bird individuals of a kind, found *alive* (or even dead) off the body of a bird. They make their migration from host individual to individual on occasions of actual bodily contact of these hosts, as at mating, and in the nest.

So it is practically certain that the hoatzin is host to a Mallophagan kind, which is most nearly related to a species, or, perhaps indeed, is but a variety of the very species, found heretofore only on Old and New World ibises and courlans.

VERNON L. KELLOGG
STANFORD UNIVERSITY

THE TOXICITY OF INSECTICIDES

CERTAIN facts which may be of general importance in physiological investigations were brought to light in a study of the toxicity of insecticides now under way at the California Agricultural Experiment Station.

A very elaborate series of determinations were made on the effect of hydrocyanic-acid gas on scale insect eggs. The plan of the experiment was to separate the eggs found beneath a scale insect into two lots of about equal size, placing them in gelatin capsules, one lot being allowed to hatch without treatment, and the other after being exposed to the gas for a definite time. The species studied lay on the average rather more than a thousand eggs, and each series of experiments included the eggs from a hundred insects. Nearly three hundred series were thus studied, including five different species of scale insects from eleven different localities in California.

Solutions of hydrocyanic acid of varying concentration were placed in closed glass containers and the open capsules containing eggs to be treated were suspended above these solutions. The density of the gas above these solutions is dependent on the concentration and temperature.

After hatching, the capsule was placed under a microscope and an estimate was made of the hatch in each lot, using only the numbers 05, 10, 20, 30, 40, 50, 60, 70, 80, 90, 95, 100 per cent. The following table will show the results of one series.

The upper right-hand corner gives the results with the weakest dose and shortest time. As would be expected, in the opposite corner, there is no hatch and the mean percentages given below show the effects of the different concentrations, the last two or three of which are completely ineffectual since the hatch is the same as the untreated check lots.

The series of means given at the right bring out an entirely unexpected result, apparently showing that the length of time the eggs remained exposed to the gas has very little effect. This is, however, not at all the fact as shown by the curves on the left side of the table.

The average means of 72 series of experiments with the same insect from the same food plant and locality are 58.31, 59.20, 56.10,

PERCENTAGE OF HATCH

European Fruit Scale on Christmas Berry

Duration of treatment	Concentrations 512	256	128	64	32	16	8	4	2	1	Mean	Check
1	0	0	60	50	80	80	0	100	95	0	46½	77½
1.6	0	0	90	80	0	0	80	0	95	30	37½	79½
3	0	5	90	80	10	90	0	100	80	80	53½	83
6	0	30	60	0	0	0	50	50	100	20	31	82½
11	0	0	0	60	0	20	0	100	100	80	36	79
20	0	20	5	0	80	30	60	100	95	95	48½	72½
35	0	0	0	10	0	60	0	100	10	90	27	69½
59	0	0	0	50	50	100	90	100	95	95	58	80½
98	0	0	0	0	0	20	60	100	50	100	33	75
160	0	0	0	20	0	20	50	100	50	100	34	74½
Mean	0	5½	30½	35	22	42	39	85	77	69	40.5	
Check	88½	75	74	61½	65½	68½	96½	98	77	69		77.35

54.30, 52.20, 50.10, 48.50, 48.01, 46.51 and 43.30, respectively.

In all such experiments individual variation will be very pronounced, but averages based on as large a number of series as this are quite dependable, and we can safely say that long continued action of cyanide at a strength below that producing fatal results exerts on the contrary a benign influence.

It will be remembered that fatal results follow, as a rule, from weaker doses when the time of exposure is long, but far short of the theoretical proportion that would follow on the assumption that the toxicity was dependent on the amount of gas absorbed and that this varied directly as the time and density.

The possible explanation used on the assumption of the production of antibodies within the egg can only partially, if at all, account for the facts since another phenomenon, the acceleration of the rate of development resulting in an earlier hatching, is also evident.

The quickened cell activities indicate that the effect of cyanide, at least in light doses, is to increase cell permeability, a process of rejuvenescence which may be specially useful in an insect's egg so full of yolk material. Decreased permeability is generally considered the measure of approaching death, but it may be that acute poisons like the strong insecticides produce a violent death of cells by the sudden or excessive increase in catabolism.

A third suggestion which may seem rather bold to offer in the case of animal tissue is the possibility of the nitrogen of hydrocyanic acid being available as food directly utilizable by the protoplasm of the cells. The basis for this suggestion is the fact that in a series of experiments by Mr. E. Ralph Ong, conducted in my laboratory with seeds in hydrocyanic acid solutions, a very remarkable and similar acceleration in time of sprouting was observable when the solution was slightly short of a toxic strength, and these plants developed with all the appearance of having had a strong nitrogen fertilization. There is no doubt of the ability of plant tissue to utilize nitrogen in various forms, and we know of no special mechanism necessary to accomplish this which is characteristic of vegetable protoplasm.

The cyanide produced from hydrocyanic acid absorbed in the tissue of a scale-insect egg when not immediately fatal, but present in considerable quantities may be either utilized as food or act as a disturber of the equilibrium of cell permeability or both and in addition it may cause a reaction bringing about the production of antibodies which will neutralize the poison. One or more of these factors may produce a degree of immunity from

the effects of long continued exposure to hydrocyanic-acid gas and, indeed, counteract the effect to such an extent that the surviving eggs hatch better than those with short treatment in the gas. Both animal and plant tissues thus exhibit very decided evidences of definite cyanide stimulation.

C. W. WOODWORTH
UNIVERSITY OF CALIFORNIA

THE AMERICAN SOCIETY OF NATURALISTS

THE thirty-second annual meeting of the American Society of Naturalists was held in the zoological laboratory of the University of Pennsylvania on December 31, 1914. In affiliation with the society this year were the American Society of Zoologists, the Botanical Society of America, the Society of American Bacteriologists, and the American Psychological Association.

By-law No. 3 of the society was amended to read "The Records of the society shall be published once every three years beginning in 1914. The Records shall contain the constitution and by-laws of the society, the minutes of all meetings held within the period covered, the treasurer's reports, and a full list of members of the society."

An invitation to the society from the Pacific Coast Committee on Zoological Program to participate in the sessions concerned with zoology during the convocation week of the American Association for the Advancement of Science, to be held in August, 1915, received the following action. It was voted that the secretary express the appreciation of the society for the invitation and its best wishes for the success of the Pacific Coast meetings. The American Society of Naturalists suggests that members resident on the Pacific Coast organize, if they so desire, a section of the society in accordance with the provisions of Art. IV., Sec. 3, of the constitution, and that this section in cooperation with the American Association for the Advancement of Science hold a meeting in August, 1915.

There were elected to honorary membership in the society Hugo De Vries and Wilhelm Roux.

The following were elected to membership: W. C. Allee, University of Oklahoma; Charles E. Allen, University of Wisconsin; Cora J. Beckwith, Vassar College; Charles E. Bessey, University of Nebraska; William W. Browne, College of the City of New York; W. A. Cannon, Desert Botanical Laboratory; Ralph V. Chamberlain, Museum of Comparative Zoology; Maynie R. Curtis, Maine Agricultural Experiment Station; John A. Detlefsen, University of Illinois; Dayton J. Edwards, College of the City of New York; Arthur H. Estabrook, Eugenics Record Office; Richard Goldschmidt, Kaiser Wilhelm Institut für Biologie; John W. Harshberger, University of Pennsylvania; Marshall A. Howe, New York Botanical Garden; Hartley H. T. Jackson, U. S. Department of Agriculture; Thomas H. Kearney, U. S. Department of Agriculture; Henry H. Lane, University of Oklahoma; W. H. Longley, Goucher College; Henry Laurens, Yale University; George R. Lyman, U. S. Department of Agriculture; John M. Macfarlane, University of Pennsylvania; Frederick C. Newcombe, University of Michigan; Susan P. Nichols, Oberlin College; Theophilus S. Painter, Yale University; Arthur S. Pearse, University of Wisconsin; Herbert W. Rand, Harvard University; Charles G. Rogers, Oberlin College; Forrest Shreve, Desert Botanical Laboratory; William C. Stevens, University of Kansas; L. B. Walton, Kenyon College; Orland E. White, Brooklyn Botanic Garden.

A cordial vote of thanks was passed to the University of Pennsylvania for its hospitality.

The program of the morning session was as follows:

A. F. Blakeslee and D. E. Warner, "Correlation between Egg-laying Activity and Yellow Pigment in the Domestic Fowl."

A. F. Blakeslee, "A Sexual Mutation in a Vegetatively Propagated Pure Line of Mucors."

Sewall Wright (by invitation), "The Albino Series of Allelomorphs in Guinea-pigs."

H. S. Jennings, C. S. Lashley, A. R. Middleton, F. M. Root and Ruth J. Stocking, "Researches on the Inheritance and the Results of Selection in Uniparental Reproduction."

Edward M. East, "The Phenomenon of Self Sterility." (Read by title.)

Helen D. King, "The Effects of Inbreeding and Selection on the Growth, Fertility and Sex Ratio of the Albino Rat."

H. H. Newman (by invitation), "Development and Heredity in Heterogenic Teleost Hybrids." (Read by title.)

Alice M. Boring, "Data on the Relation between Primary and Secondary Sexual Characters in the Domestic Fowl."

R. A. Emerson, "Somatic Mutations in Variegated Maize Pericarp."

H. J. Webber and C. H. Myers, "Bud Variation within Tuber Lines of the Common Potato."

Clarence C. Little, "The Inheritance of Certain Types of Spotting in Mice."

George G. Scott, "Some Indications of the Evolution of the Osmotic Pressure of the Blood and Other Body Fluids." (Read by title.)

H. D. Fish, "The Increase in Homozygosis which results from Certain Systems of Inbreeding."

The session of the afternoon consisted of a symposium, in joint session with the American Society of Zoology and Section F of the American Association for the Advancement of Science, on the subject "The Value of Zoology to Humanity."

E. G. Conklin, "The Cultural Value of Zoology."

C. B. Davenport, "The Value of Scientific Genealogy."

G. H. Parker, "The Eugenics Movement as a Public Service."

Stuart Paton, "Preparedness for Peace."

H. F. Osborn, "The Museum in the Public Service."

The Naturalists' dinner was held on the evening of December 31, at the Hotel Walton, with one hundred and forty in attendance. The president, Professor Samuel F. Clarke, described the founding and early history of the society, following whom Dr. A. G. Mayer, as retiring vice-president of Section F, gave an illustrated address on "The Research Work of the Tortugas Laboratory of the Carnegie Institution of Washington."

The officers of the Society for 1915 are:

President—Frank R. Lillie, University of Chicago.

Vice-president—Rollin A. Emerson, Cornell University.

Secretary—Bradley M. Davis, University of Pennsylvania (1914–16).

Treasurer—J. Arthur Harris, Carnegie Station for Experimental Evolution (1915–17).

Additional Members of the Executive Committee—Ross G. Harrison, Yale University (1914–1915); Raymond Pearl, Maine Agricultural Experiment Station (1914–16); Henry V. Wilson, Adeline Ames, Department of Agriculture, University of North Carolina (1915–17).

Bradley M. Davis,
Secretary for 1914

AMERICAN SOCIETY FOR EXPERIMENTAL PATHOLOGY

First session Monday, 2 P.M., December 28, 1914. The society was called to order by President R. M. Pearce. Report of council by secretary. The following papers were presented by members of the society:

"Studies on Streptococci," by E. C. Rosenow. Discussion by Drs. Pearce, Wells, Adami and Whipple.

"Observations on the Formation of Antibodies," by Ludvig Hektoen. Discussion by Dr. Karsner.

"Auto-plastic and Homio-plastic Transplantations of Tissues," by Dr. Leo Loeb. Discussion by Drs. Opie, Ulenhuth and Loeb.

"Further Studies in Nitrogen Retention and Renal Function," by Dr. H. T. Karsner. Discussion by Drs. Wells, Pearce, Opie and Karsner.

"Metastatic Calcification," by Dr. H. G. Wells. Discussion by Dr. Adami.

"Studies in Bile Pigment Excretion," by Drs. G. H. Whipple and C. W. Hooper. Discussion by Drs. Wells, Pearce and Whipple.

"The Influence of Diet upon the Progress of Bacterial Infection," by Drs. E. L. Opie, L. B. Alford. Discussion by Drs. Loeb and Wells, Karsner, Whipple and Opie.

Papers read by title:

"The Effect of Previous Intravenous Injections of the Pneumococcus upon Experimental Pneumonia by Intrabronchial Insufflation of the same Organism," by Drs. B. S. Kline and S. J. Meltzer.

"Further Studies Upon the Experimental Production of Leprosy in the Lower Animals," by Dr. C. W. Duval.

At the conclusion of this scientific session the society went into executive session for the election of officers and new members and transaction of business. Dr. Theobald Smith was unanimously elected president for the ensuing year. Dr. G. H. Whipple was elected vice-president for the ensuing year. Dr. Peyton Rous was elected secretary-treasurer for the ensuing year. Dr. R. M. Pearce was elected councillor in place of Dr. Harvey Cushing whose term expired.

The following new members were elected: Dr. James B. Murphy, of the Rockefeller Institute, Dr. L. G. Rowntree, of the Johns Hopkins Hospital, Dr. Richard Strong, of the Harvard Medical School, and Dr. M. C. Winternitz, of the Johns Hopkins Medical School.

On Tuesday afternoon, December 29, at 2 P.M., and Wednesday morning, January 30, 9 A.M., joint meetings of the Physiological, Biochemical, Pharmacological and Pathological Societies were held. The details of these meetings may be found in the proceedings of these respective societies.

George H. Whipple